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EDITORIAL

FORESTRY AND THE UNEMPLOYED

CONGRESS will be importuned this winter from many directions to give first consideration to the unemployment problem. Of all the proposals that will be offered, the out-and-out dole probably has the least chance of success. If any aid at all will be rendered it doubtless will be by providing work. Furthermore, if any government works are created in order to employ large numbers of needy men, they will have to be of a kind which can be started and stopped at short notice and which at the same time will not involve the government, when the depression is past, in continuing maintenance expenditures which under normal conditions would not have been authorized. Many organizations will offer suggestions. The forestry profession itself should prepare to meet the situation. Two proposals can be made: one, a huge reforestation program; the other, a clean-up and improvement program. Reforestation has the disadvantage in the present emergency of taking a long time to get under way and of being seasonal. Furthermore, great nurseries must be established, huge quantities of seed must be collected, and stock must be grown and held in the nurseries a year or more before it can be planted in the field. By the time such a program could become effective the critical period in unemployment will likely be past, interest and appropriations will lag, and the investment in nurseries and stock may be lost.

A huge reforestation program will be objected to by those who feel that we are not able to care properly for the timber already grown and that we should give first attention to what we have. The work of improving present forests and parks can be started on short notice and can be stopped quickly without a penny of loss. Our present growing forests are in a horribly unsatisfactory condition from both silvicultural and fire hazard aspects. Every forester knows what can and should be done to improve these conditions had he the necessary funds to do it. In one area and along routes of travel where the fire hazard may be great it could be reduced by a general clean-up of standing and

down dead material. In another area some simple silvicultural operation would result in improved growth and some cheap cord wood for the homes of the unemployed. In still another area where the surface has been denuded, simple but effective check dams or rows of brush could be added to hold the soil. In the latter case private lands should be included because of the larger public interests at stake in the valleys. Expenditures for all such improvements have the advantage of ultimately coming back into the public treasury through lessened fire losses and protection costs, improved growth and yields, and reduced erosion losses and costs of keeping ditch and stream channels open.

It is not at all certain that Congress will adopt any great national work program. If, however, it shows an inclination to do so, foresters should be prepared with plans for such work in the public's own forests. Connecticut has already shown the way and proven that public emergency funds can be spent to good advantage for the two-fold purpose of relieving the present distress among the unemployed and of having work done in the state forests, the cost of which can be considered a well-paying investment.

Foresters connected with states and municipalities might take a suggestion from Connecticut for similar work and be ready with plans when drives are made for more employment on public works. Relieving the present distress is not a job for the federal government alone.

EFFECT OF RELEASE UPON THE FORM AND VOLUME OF WESTERN YELLOW PINE

By WALTER H. MEYER

Associate Silviculturist, Pacific Northwest Forest Experiment Station

A study of western yellow pine in selectively cut stands in Oregon and Washington shows that there is a progressive change in form dating from the time of release. Previous to release the trees, irrespective of form class, tend to improve in form, while directly after the release cutting all form classes tend to converge in a single belt, in which form class 0.725 is the most significant. It was found also that volume tables in use for virgin stands apply equally well for stands released for various periods.

WHEN A FOREST stand is heavily thinned, especially when as much as from 50 to 80 per cent of the merchantable volume is removed, the rate of growth of many of the remaining trees will increase because of improved moisture and light conditions. In the western yellow pine forests, naturally uneven-aged and open-grown, the effect of moisture is of paramount significance, while that of light is only of secondary importance. With this species, accelerated growth results rather from an increased amount of available water than from an extension of crown growing space.

The usual practice in marking western yellow pine by the Forest Service in the North Pacific Region leaves from 15 to 20 per cent of the merchantable volume to furnish the basis for a second cut and to act as an insurance for a good stand of reproduction. Since many of the trees of the virgin stand enjoy as much space, both aerial and terrestrial, as can be of any possible use to them, and since some of the groups are left untouched by the cutting, a number of trees in the residual stand will not show quickened growth.

The most convenient method of examining the effect of release is to bore the trees at breast height and measure the change in radial increment. Numerous studies of this nature have been undertaken for many species, but few have made the essential further step of attempting to define the increase occurring in the upper portions of the bole. That such knowledge is essential is beyond doubt. Especially important is it in a study of the growth and yield capacities of selectively cut stands, in which a reduction of volume estimates or a modification of volume tables is involved, because of change in average tree form.

For the study of the question of changing form, measurements were made on 174 trees, released from 20 to 40 years ago, on ten different forest areas in Washington and Oregon. Stem analyses were prepared from increment borings taken clear to the center at each 16.3-foot interval, with closer intervals in the tops, and the trees were reconstructed for decades as far back as 30 years before release. This process is illustrated in Figure 1. The exact methods of measurement and correction to obtain the best taper

curves need not be gone into in detail, although careful technique is an important requisite. The methods include correction of the radial increment readings, which seldom represent the true average radius of the section; interpolation for height growth; correction for bark thickness, which gradually increases with age; elimination of uncertain and eccentric data, which are unavoidably present since the examiner cannot always foresee the interior condition of the tree.

The analysis falls into two main divisions. The first is a study of the change in tree form, and the second is a study of the change in actual volume as compared to tabular volume for equivalent sizes.

Form class in this case is defined as:—

$$\frac{\text{d. i. b. at one-half height above breast height}}{\text{d. b. h. i. b.}}$$

Butt swell, if it exists, is included in the d.b.h.i.b. By use of the form classes computed back for all decades to 30 years before cutting, the change in form of each tree over a 50- to 70-year period can be traced and the effect of release determined.

A volume table of the kind in current use does not provide for differences of form class, and cannot hope to give accurate estimates for each single tree; hence the trees must be taken by area aggregates and not individually. A curve is shown which gives the deviation of actual volume from tabular volume due to difference in form class.

Change in Form Before and After Release

All the trees of the 174 samples, irrespective of origin, that were suitable for a study of the change in form were divided into groups based upon the form class at the time of release, and averages were computed for each

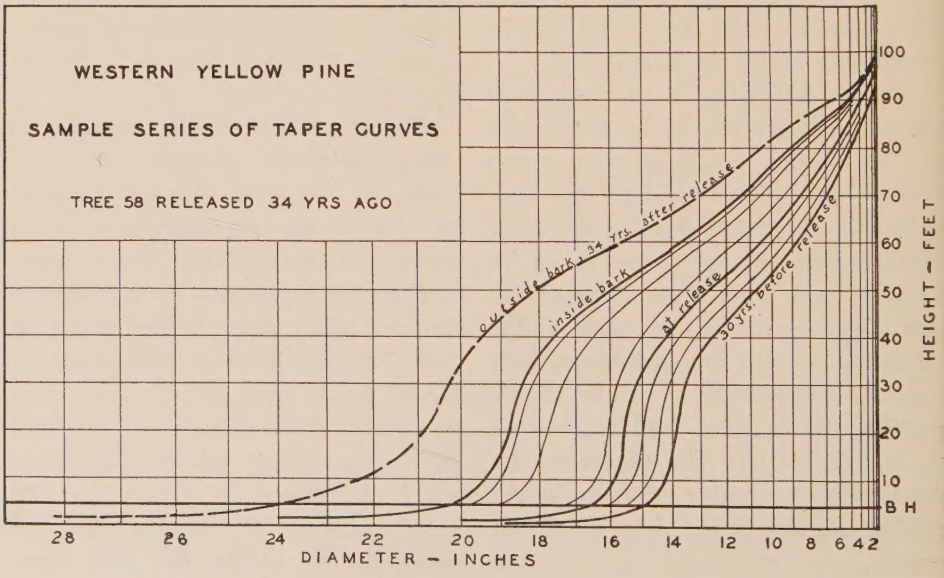

Fig. 1.—Sample series of taper curves.

decade. The form class groups ranged from 0.525 to 0.864 at the time of release, a rather wide range but probably not much wider than that of any extensive natural forest stand. Tabular evidence is here omitted in favor of the graphical evidence of Figure 2, which illustrates the trends more effectively, especially since these trends are not constant in character but vary from the lower to the higher form classes. Previous to release, almost all the form classes are slowly improving. Soon after release a change sets in. The form classes below the 0.700 to 0.750 belt improve at a faster rate, and the further from this belt the greater the improvement. The form classes above the belt, however, deteriorate and again the further away the faster they deteriorate. The general tendency seems to be to get into the 0.650 to 0.750 form class belt. All the released trees therefore tend to approach an average form, which in all probability is in the neighborhood of 0.700 to 0.725. This evidently is the form class for trees which are grown in the open, a position of balance, so to speak, between all the stresses and strains. Fortunately the average form class represented by the volume table[1]

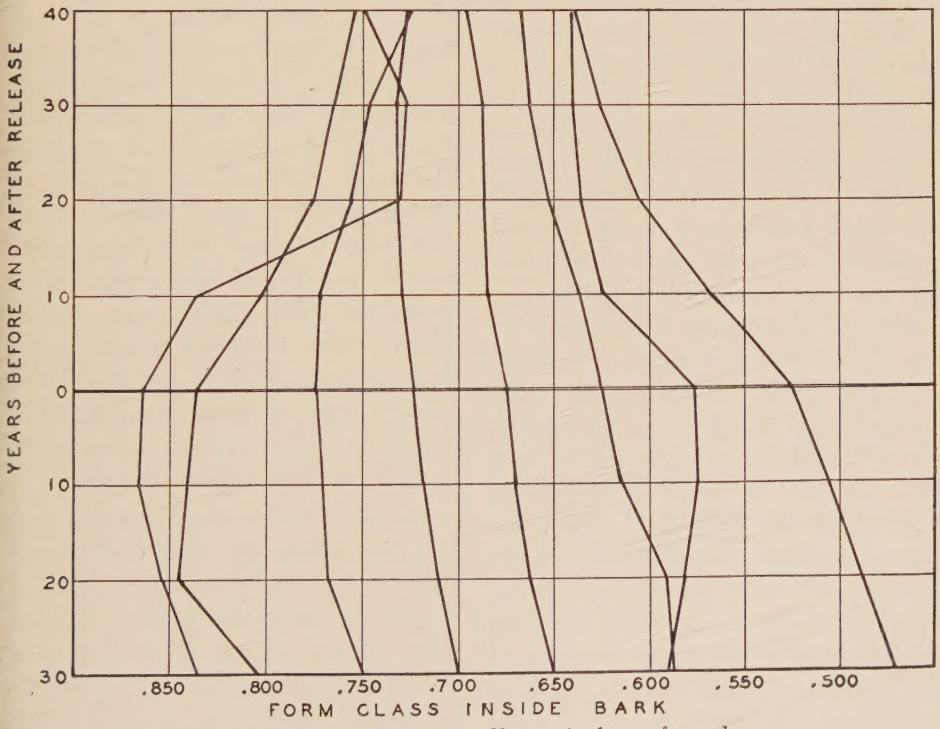

FIG. 2.—Western yellow pine. Change in form after release.

[1]Meyer, W. H. and Washington office, U. S. Forest Service. Volume tables and volume alinement charts for western yellow pine on Sites II, III, IV, and VI. Mimeographed by Pacific Northwest Experiment Station, April, 1930.

lies also in this belt, as is shown by Figure 3. This chart shows that the 100 per cent volume coincides with the 0.700 to 0.725 form class range.

The gist of the above, therefore, is that after release low form classes improve, high form classes deteriorate and medium form classes remain constant, all seeking a common level, which apparently lies in the neighborhood of 0.700 to 0.725. The resulting stand is consequently a much more homogeneous one than the original stand.

Trends of Actual Volume in Respect to Tabular Volume

Although the evidence so far has shown on the whole the trees in a released stand tend to converge towards an average form class, this in itself is no evidence that the volume tables in use will apply equally well to virgin stands as well as released stands of any age, since form does not enter as a factor into the volume table, and since there is no indication how it progresses or varies with diameter and height. Therefore, the question arises as to whether, after release, the stimulus in growth, which may or may not be properly distributed throughout the bole, will make the actual average tree volume diverge progressively more and more from the tabular volume as the years advance. To test this effect the trees were grouped by locality (although in most instances there were too few to provide a good sample), and under localities by ten tree groups; the volume change of each locality and group was followed from decade to decade, regardless of form class. Some groups were consistently low and some consistently high because of the unrepresentative character of the sample. However, it is the relative change, or the progressive difference in the ratio of actual to total volume which is of primary interest in this particular connection.

In Table 1, the ten localities are listed. Two of them, because of the elimintaion of undesirable material and small sizes, provide weak samples but are nevertheless included for the sake of completeness. The trend of the grand total, starting out with 95.0 per cent, arriving at 96.1 per cent at time of release and lowering to 95.2 per cent after thirty years is of greatest significance. The forty-year percentage is somewhat lower (93.8), but this is due to the dropping out of 63 trees. The total change from the time of cutting to thirty years after is therefore only 0.9 per cent, a quantity hardly worthy of correction, since there are other complicating factors which might introduce errors many times as large, such as a difference in average form of 0.050 points, which, according to Figure 3, is accompanied by a 7 per cent volume change.

The total effect is therefore negligible; but what about the individual areas? Omitting the two areas, No. 3 and No. 6, with an insufficient number of trees, there is only one on which the deviation is at all disturbing and beyond the bounds of acceptable variation. This is No. 8, Cle Elum S.E., a group of 9 trees. Possibly the number of trees is so small that the disproportionately

TABLE 1

RELATION OF ACTUAL VOLUME TO TABULAR VOLUME BEFORE AND AFTER RELEASE
WESTERN YELLOW PINE

Locality	Years before release			Time of cut	Years after release			
	30	20	10	0	10	20	30	40
	Ratio actual volume (minus stump)[1] to tabular volume. Per cent.							
1. King Mtn. 17 trees	90.2	92.5	93.6	94.4	93.4	93.3	96.2	96.1
2. Sumpter 36 trees	92.9	96.6	96.0	96.3	96.5	96.4	97.5	99.0
3. N. Powder 2 trees	76.9	81.2	83.3	85.7	88.3	79.6	79.2	78.6
4. Five-Point 21 trees	87.4	87.4	86.8	86.8	89.8	92.3	88.8	87.3
5. Conconully 12 trees	93.3	92.6	98.2	98.1	99.6	95.8		
6. Orient 4 trees					93.5	92.6		
7. Cowiche 21 trees	99.5	96.4	97.3	97.7	98.9	96.4	95.4	
8. Cle Elum SE 9 trees	94.7	96.3	98.7	102.0	95.4	95.7	94.4	
9. Cle Elum NE 23 trees	103.0	101.3	98.6	98.6	100.1	99.2	98.0	
10. Wenas 17 trees	92.6	95.0	94.4	95.2	95.2	94.4	93.9	93.4
Grand total 162 trees	94.9	96.1	95.7	96.2	96.4	95.6	95.2	93.9

[1]Note: For total actual volume, 5 per cent should be added so as to include the stump; tabular volume includes stump.

large number of trees of high form class and a single, erratic tree affect the normal trend too much.

All the remaining groups are satisfactorily constant after release, differing from —2.3 to +1.6 per cent for the areas with larger number of trees. Some rise a few points and others fall a few. Even if the groups are subdivided into 10-tree lots, there are few pronounced deviations. On the whole, the larger the number of trees in a sample, the better is the conformity.

Further study of form and volume change is possible by investigating the actual diameter growth at each section or by studying the volume change in each section. However, the two lines of reasoning which have been followed are probably sufficient to support the contention that, at least for the region and species in question, new volume tables, or volume adjustments, are not necessary for the released stand. No claim is made that this conclusion applies to any other species or to other parts of the pine region; it probably does not apply to fairly heavy stands mixed with other species. But it does seem to be applicable to a selectively cut western yellow pine stand in the uneven-aged, open-grown state, so common in the Pacific Northwest.

Variation of Tree Volume with Form

Figure 3 shows the effect of grouping the trees by form class and com-

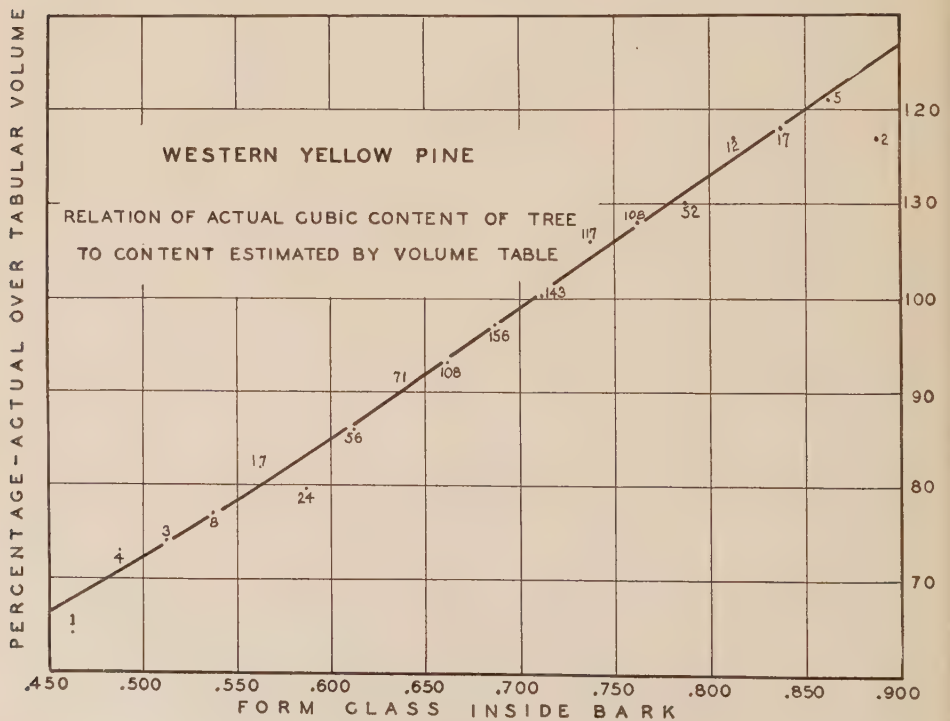

Fig. 3.—Relation of actual to estimated content.

paring actual volumes with the corresponding tabular volumes. Roughly, for every increase of 0.050 in form class there is a 7 per cent increase in volume. The influence of the average form class of the stand upon the volume estimate is striking.

Is it possible however for large groups of trees to depart radically from the average form? For instance, taking a classification such as the Dunning system for western yellow pine[2] which recognizes seven tree classes based upon relative desirability for leaving as the nucleus of a reserve stand, but also on age and dominance class, is there any systematic departure from the average form of any single tree class? An examination of the material shows that each tree class by itself covers a wide range of form classes, but that the trees of Class 1, the young, dominant trees, average about 0.025 points less than the trees of Class 3, the mature, dominant trees. Also the trees of Class 2 and 4, which are respectively the codominant trees of the young and mature age classes respectively stand about 0.025 points higher than Classes 1 and 3. It is probable therefore that small differences in average form over large areas may exist, depending upon the prominence of one tree class or another.

Summary and Application

A study of western yellow pine in selectively cut stands in Oregon and Washington shows that there is a progressive change in form dating from the time of the release. Previous to release the trees, irrespective of form class, tend to improve in form, that is to say the upper diameters are increasing at a faster rate than the diameter at breast height. Directly after the release cutting, however, all form classes tend to converge into a single belt, in which form class 0.725 is probably the most significant value. In other words, the average form tends to remain the same, although there is a relative difference in the trend of form change among the various classes. As a result, the aggregate volume varies at any date but slightly from the computed value taken from volume tables built up for trees in virgin stands. The volume table in use therefore seems to apply equally well to virgin stands and to stands which have been released for various periods, a highly satisfactory conclusion as far as ordinary volume and yield computation is concerned.

The significant relation between form and volume is shown by the fact that for each 0.050 increase in form class there is approximately a 7 per cent increase in volume. Some trees were found which fell into a form class as low as 0.450 to 0.500, others as high as 0.850 to 0.900, the former having a volume about 30 per cent below and the latter about 20 per cent above the average. This indicates that if a cutting destroys the balance of form class on a large scale an adjustment will have to be made in the computation of stand volumes.

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[2]Dunning, D. A tree classification system for the selection forests of the Sierra Nevadas. Journal of Agricultural Research 36(a):755-771. 1928.

A STUDY OF ORGANIC FACTORS CONCERNED IN THE DECADENCE OF BIRCH ON CUT-OVER LANDS IN NORTHERN NEW ENGLAND[1]

By PERLEY SPAULDING[2] and H. J. MacALONEY[3]

Investigations of decadence of birch in cut-over lands of northern New England show that injuries induce attacks of the bronze birch borer and the root rot fungus. Decadence appears to be due to abnormal environmental conditions caused by logging operations and drastic opening of the canopy.

IN THE White Mountain National Forest an effort has been made for a number of years in the lumbering operations to save smaller trees of paper birch, (*Betula papyrifera* Marshall) and yellow birch, (*Betula lutea* Michaux) especially of the latter, but with discouraging results because of a puzzling decadence of these trees shortly after the cutting. This has been especially serious in stands that were heavily cut. See Figures 1 and 2. In 1927 Mr. R. C. Hall, then field assistant in entomology at the Northeastern Forest Experiment Station,[4] made preliminary studies of this trouble in the White Mountain National Forest which showed that the bronze birch borer, *Agrilus anxius* Gory, was heavily infesting the diseased trees. In 1929 he continued intensive studies of the environmental conditions as a coöperative project with the United States Forest Service, the United States Bureau of Entomology, and the University of Michigan. This season's work showed among other things that the root rot fungus *Armillaria mellea* (Vahl) Saccardo was attacking some of the diseased trees, and since the borer did not seem to be entirely responsible for their decadence, the question was raised as to what part *Armillaria mellea* takes in it. Since the status of the borers was not entirely settled, it was deemed necessary that further investigations in this region should be the joint work of entomologists and pathologists. Accordingly in 1930 the writers attacked the problem in the same localities where Hall worked in 1929. Parts of the present investigations extended into other parts of New Hampshire and into Vermont.

The Forest Service allowed such trees to be felled as seemed necessary for detailed examination, and also furnished a portable gasoline fire pump from the local ranger station far washing out roots. The Bureaus of Ento-

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[1]Presented at the winter meeting of the New England Section of the Society of American Foresters at Providence, R. I., February 23-24, 1931.

[2]Senior Pathologist, Bureau of Plant Industry.

[3]Assistant Entomologist, Bureau of Entomology.

[4]In coöperation with the Northeastern Forest Experiment Station, Amherst, Mass. Published by permission of the Secretary of Agriculture.

mology and Plant Industry furnished two men each to carry on the investigations. A fifth man was furnished through contributions from the Vermont State Forest Commissioner and the Brown Company of Berlin, New Hampshire. The latter also allowed examination of certain of their stands which were favorable for the purpose.

The Original Stand

The stands covered by the present investigations were originally of the spruce-hardwoods type. The softwoods, which were spruce (*Picea rubra* Link), with some balsam fir (*Abies balsamea* [Linnaeus] Miller), usually predominated. In one stand, where most of the work was done, the hardwood species were yellow birch, paper birch, beech (*Fagus grandifolia* Ehrhart), and red maple (*Acer rubrum* Linnaeus). In another stand, in which the most recent cuttings were examined and which more properly would be called a paper birch type, the hardwood species were paper birch and a few scattered yellow birches and red maples. Here the stand of intermixed softwood was quite heavy. On both areas the stand was heavy, the covering of the soil being practically complete. Openings in the cover were so small that the sun had unobstructed access to any given area but a relatively short time during the day. Under these conditions the soil temperature was low, and the soil moisture was relatively high even in midsummer. This is shown by the fact that in this region forest fires will rarely run any distance in an uncut stand.

Conditions in the Cut-Over Areas

The remaining trees

The trees left on these cut-over areas were literally but a remnant of the original stand. The yellow birch trees examined were in two age classes; one 50 to 60 years and the other 100 to 120 years. In the last 15 years the average annual diameter growth of 25 of the 50-60 year trees was 0.057+ inch: of the same number in the 100-120 year class it was 0.037+ inch. These trees ranged in d. b. h. from 3.1 to 9.6 inches. There is evidence of long continued suppression. After the cutting the younger trees increased growth of annual rings slightly, but apparently could not overcome the shock of much more intense light and heat resulting from the opening of the stand. The upper twigs and branches died before they could adjust themselves to the condition abnormal to them.

The paper birch also was in two similar age classes of 50 to 60 and 100 to 120 years. The average annual diameter growth of 25 trees of the younger class was 0.07 inch; for 25 of the older class the average annual diameter growth was 0.04 inch. These trees ranged from 3.1 to 11.7 inches d. b. h. According to the authorities, seedling paper birch matures at about 75 years, and at about 35 years diameter growth decreases. It presumably loses its sprouting ability with this decline in vigor. At 50 years it has begun to decline in vigor and probably actual decadence from old age has begun although it may not be perceptible to us. The paper birches exam-

ined were at or well beyond the critical age for this species and simply did not have the stamina to overcome their greatly changed condition.

Study of a few red maples which were among the birches shows the same evidence of long suppression and inability to quickly recover, although there were no dead top twigs as in the birches, and it appeared that there was a chance of their finally recovering.

PHYSIOLOGICAL CHANGES

Immediately after cutting a great change takes place. The cutting usually removes 75 per cent or more of the canopy while the hauling of logs, etc., temporarily removes most of the ground cover. The slash piles cover 20 to 50 per cent of the soil surface according to the amount of timber removed. The softwood slash is burned. In the first summer after cutting, the soil, except under slash piles, is bare of vegetation. In the latter part of the first summer herbaceous plants get a start but are rather scattering. By the second year the herbaceous plants are largely reëstablished and sprouts of the hardwoods and shrubs heavily shade the ground again. The first year, because of the denuded conditions of the soil, its surface temperature in midsummer obviously cannot fail to be abnormally high. The removal of most of the trees greatly reduces the amount of soil water which is removed by transpiration. The dying of the roots of the felled trees must greatly decrease the competition of roots for water. But the evaporation of water from the exposed soil surface must be greatly increased. The dry condition of the surface soil plainly indicates that the soil moisture near the surface is abnormally low. Both constitute a great peril to the remaining trees. The dragging off of much duff in the log drag-ways exposes bare soil over a considerable percentage of the total area. Thus, during the first year, the remaining trees on a cut-over area are subjected to a tremendous shock, in the sudden exposure of the crown and stem to unaccustomed hot sunlight in summer and to unusual freezing and changes of temperature in cold weather, while the roots are equally exposed to unaccustomed heat and dryness in summer and freezing in winter. In brief, the entire environment of the tree is suddenly and perilously altered; fortunately soil conditions are reëstablished to some extent after about two years and the freeing of the crown and reduced root competition incites more vigorous growth if the tree is in a condition to overcome the great handicap of the altered situation.

LOGGING AND OTHER INJURIES

Aside from the above mentioned environmental changes we find there are other destructive factors. In the felling of the trees branches are broken out of those left standing, blazes and other axe marks are made on numerous trees left standing. Invisible bruises are numerous. Patches of bark are knocked off or loosened so that they finally die and fall off. Dragging out the logs often breaks roots and knocks off patches of bark from the roots and

FIG. 2.—The same group one year later. Badly decadent.

FIG. 1.—A group of yellow birches the second summer after cutting. Early stage of decadence.

at the bases of the trees left. Cutting of older and usually taller trees may even subject the remnant left to unaccustomed lightning and wind injuries. That such injuries are important is shown by the fact that of 305 trees examined carefully 51 were found with logging and axe injuries, and on one small area 10 trees bore invisible dead spots of cambium which may have been due to weaker lightning discharges.

Undue exposure of roots appears to result in burning and death of the bark on the upper side usually near the root crown but sometimes a number of feet out from the stump. Forty-five trees were found thus injured. It can be said that it is exceptional for a birch tree to come through the ordeal with none of these injuries.

There are a small number of trees which fork near the ground, one fork of which has died or been felled, leaving half the stump dead. The living part is so intimately connected with the dead rotting part that the rot gradually extends into the living wood and leads to the death of the living half. Such trees are often invaded by *Armillaria mellea.* There are also a few instances where a root of a dead tree is grown to a root or stump of a living tree, thus forming a direct bridge for *Armillaria mellea* to enter the living tree from the dead root.

FIG. 3—Root system of tree No. 1, with stump held in original position by crossed poles. The squares outlined by the string are 2.5 feet each way. Photo by W. U. Garstka.

There are some trees which already are attacked by various fungi, such as *Fomes igniarius* Fr., *Polyporus betulinus* Bull., *P. pargamenus* Fr., etc. The ordinary wood-rotting fungi, however, seem to have no relation to *Armillaria mellea.* There is a canker of the trunks and branches of birches which is widely distributed in the Northeast, that is attributed to *Creonectria coccinea* (Pers.) Seaver, and which undoubtedly kills severely attacked trees. Trees with this disease may begin decadence from this cause alone and then be attacked by borers and *Armillaria mellea.*

Injuries caused by porcupines (*Erethizom dorsatum* Linnaeus), and sapsuckers (*Sphyrapicus varius varius* Linnaeus), also contribute to the decadence of birches. Seven trees were found which were partially killed by the girdling of porcupines. Four trees were heavily attacked by sapsuckers; in at least one instance the evidence showed that the bird was extracting birch borers and had stopped a borer attack in that tree. In other cases the bird had "tapped" the trees for the sap and the insects attracted by it. This bird was feeding fledglings nearly ready to fly.

Symptoms of Decadence

The symptoms of the disease are as follows:

The first indication to be perceived is a slight thinness in the foliage of the topmost twigs. In hot midsummer weather the uppermost leaves are smaller than normal and they roll as if from drought. Then short twig tips appear without leaves. The leaves just below the bare tips are small and roll also. They increase in size to normal as one follows down the affected branch. The affected twigs die back until the entire branch is involved. Neighboring branches are apt to show the trouble simultaneously. Finally the entire upper crown dies. The decline of the tree is quite rapid in later stages.

The yellow birch appears to be a more vigorous tree than the paper birch. This may be due to the former usually having a longer crown than the latter. The former is apt to respond to thinning by producing sprouts on the exposed trunk and seems better able to fight off attacks by borers and *Armillaria mellea.*

In the stands examined the trouble is visible in standing trees by the latter part of the second summer after cutting. The next year it is plainly prevalent in most of the trees.

The Investigations Undertaken

The trees examined ranged from those in apparently perfect health through the various stages of decadence to those which had been dead two seasons. The ages of the cuttings in which these trees occurred ranged from one to seven years. Both yellow and paper birch were examined, in as nearly equal numbers as seemed feasible. All the trees of a given area were examined, rather than scattering trees chosen for special reasons.

EXAMINATION FOR INSECT INJURY

As each tree was felled it was carefully examined and the degree of birch borer infestation was noted, the infesting insects being recorded as few, numerous, or abundant. The portion of the tree where the attack began and the progress of the infestation were also noted. The year the attack began was obtained by determining the age of the larvae and by examining the position of the larval galleries with respect to the annual rings. As the sap was still running when the examination was made, little difficulty was experienced in removing the bark so that a representative portion of each tree could be worked over in a short time. The bark on the stem and the larger branches was completely peeled off with an axe or a hatchet used as a spudding iron and that on the smaller branches was removed with a large sheath knife or a carpenter's drawshave.

EXAMINATION FOR THE ROOT ROT FUNGUS

The trees were examined for *Armillaria mellea* by chipping the bark around the root crown and down the main roots as far as they could easily be uncovered. It was found that the fungus usually attacks at or near the root crown. Isolated attacks farther out on a relatively small root could not alone seriously impair the health of the tree. All exposed roots were examined.

Obviously the entire root system of

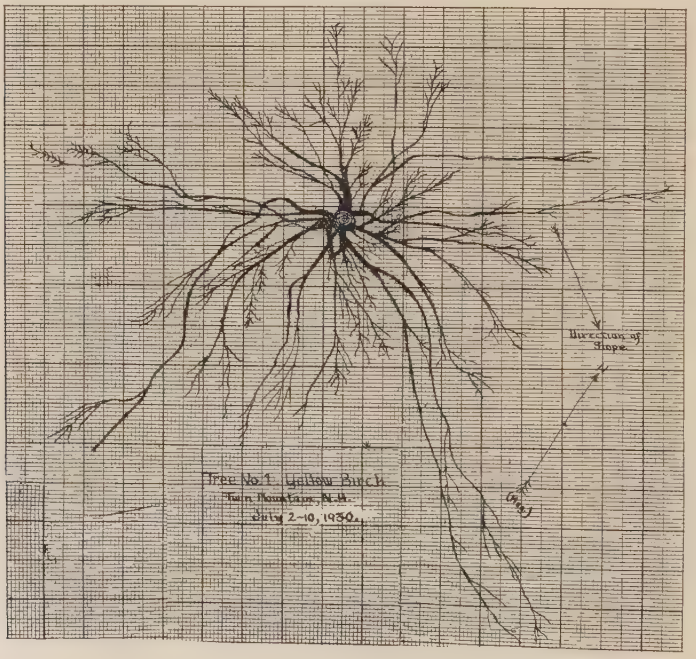


FIG 4.—Drawing of root system of decadent yellow birch. Tree 1 of series dug out.

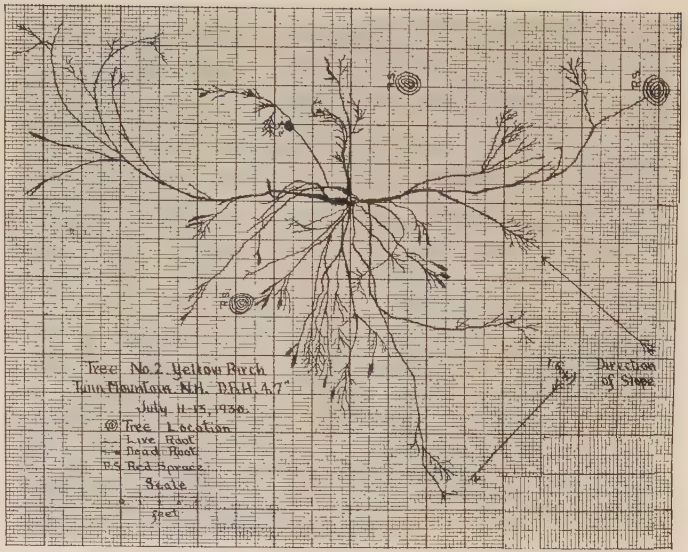


FIG. 5.—Drawing of root system of decadent yellow birch. Tree 2 of series dug out.

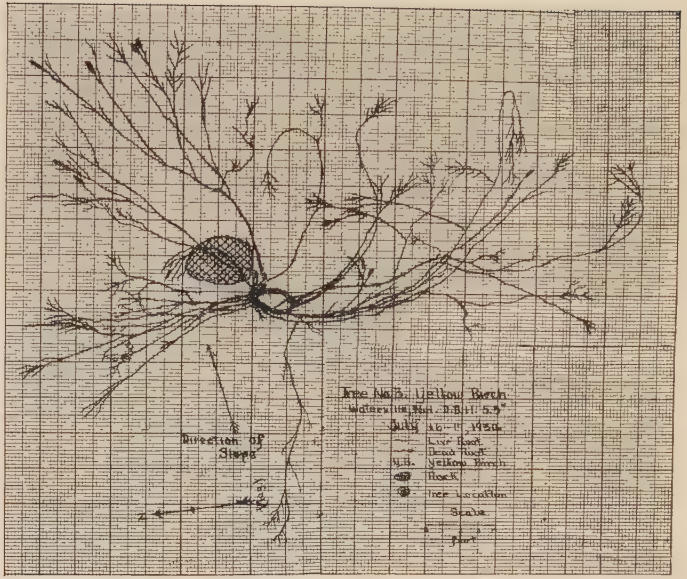


FIG. 6.—Drawing of root system of healthy yellow birch. Tree 3 of series dug out.

all the trees examined could not be exposed for inspection, as it involved too much labor and expense. However, five trees were chosen and the entire root system of each dub. Four of these were entirely dug by hand with spades, spading forks, garden trowels, pronged hand weeders, and fingers. In spite of the utmost care rootlets were broken and the results were not as satisfactory as could be desired. A fifth tree was dug out largely by means of a Forest Service portable fire pump, with excellent results. The time needed to wash out the roots of a tree 6.2 inches d. b. h. was about one day; it took 3 to 5 times that long to dig such a tree out by hand.

Results of the Investigations

Results with trees completely excavated

Five trees were carefully chosen for complete excavation of all their roots. The descriptions of these trees are as follows:

No. 1. Yellow birch at Twin Mountain, N. H. D. b. h. 4.9 inches. About 60 years old. Top dead down for 6 feet, being about half of the crown. One root on the north side of the tree was sunscalded on the upper side. There were several logging scars on the trunk. One root on the south side was found broken off at an old logling road 10 feet from the tree; the root was three-fourths inch in diameter where broken. *Armillaria mellea* was found to have attacked the dead bark for 6 inches at the broken end of this root. Unsuccessful attacks of the bronze birch borer were made in 1927 in the trunk scars, in 1928 in the crown, and in 1929 around the trunk scars. Root system dug by hand July 2 to 10, 1930.

Twelve to fifteen large roots ran off to distances of 6 to 25 feet with an almost uniform diameter and no branchlets for yards, then ran down vertically 3 to 5 feet through the podsol and coffee-brown layer into a water-bearing layer of very compact sand. Except for the tips of these "water conductors" the root tips were mostly in the first foot of soil. Old rotten logs were favorite places for the tips to run riot and branch profusely. A number of root ends were found with the tip 3 to 4 inches much enlarged, the outer cortex broken, and enclosing a black mass of fungous threads matted together around the root, which appeared healthy. This tree was dug in a preliminary way to work out methods, etc. Twine was strung in 2.5 foot squares over the roots, which were left as nearly as possible in their original position. The roots were then drawn in free hand on cross section paper on a scale of 2.5 feet to the inch. Dead root tips were not indicated, their importance not being realized until too late. See Figures 3 and 4.

No. 2. Yellow birch at Twin Mountain, N. H. D. b. h. 4.7 inches. About 60 years old. Top dead for 15 feet down, leaving about one-third of the crown alive. No *Armillaria mellea* or borers were found. Three large spruces 6 to 8 feet distant prevented the roots extending down hill as far as they might without this competition. The

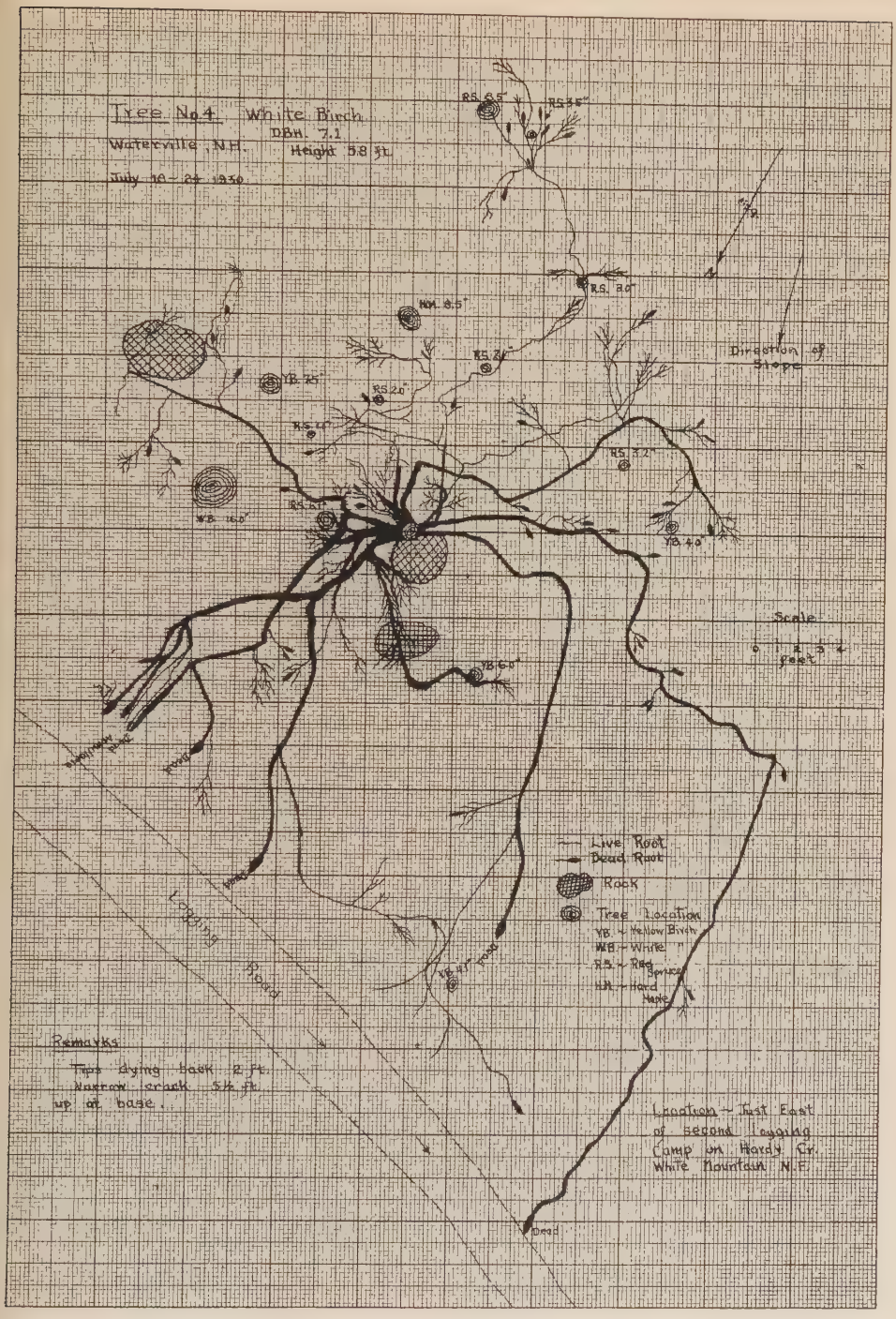


FIG. 7.—Drawing of root system of decadent paper birch. Tree 4 of series dug out.

roots were dug by hand July 11 to 13, 1930.

Two roots ran off down the hill and at a distance of about 12 feet went vertically down 3 feet to a water bearing layer of sand. Most of the roots remained within 1 foot of the surface. The root system was drawn with a plane table on a scale of 2.5 feet to the inch. As soon as a root was uncovered it was drawn. The dead root tips were shown as though enlarged to give them prominence. There were 276 living root tips and 25 dead ones, or 8.4 per cent dead tips. See Figure 5.

No. 3. Yellow birch at Waterville, N. H. D. b. h. 5.3 inches. About 30 years old. Picked as a healthy tree in an uncut stand. Crown healthy. No *Armillaria mellea* and no borers found. Dug by hand July 16 to 17, 1930, and found to be in a relatively moist situation. The dead root tips were entirely in the wettest soil. Drawn with a plane table in the same manner as No. 2, but on a scale of 2 feet to the inch. There were 275 living root tips and 11 dead ones, or 3.8 per cent dead root tips. See Figure 6.

No. 4. Paper birch at Waterville, N. H. D. b. h. 7.1 inches. About 105 years old. Tips of topmost branches dead for 1 to 2 feet. Obviously decadent. In about a medium stage of the trouble. Near the top of a steep slope. At the foot of the slope was a logging road about 20 feet distant from the base of the tree. This was a dry situation and the roots were found to extend out for an unexpectedly long ways, especially down the hill. No *Armillaria mellea* was found except on the broken end of one of the large roots at the logging road. No borers were found. Dug by hand July 18 to 24, 1930.

Upon digging this tree it was found that the tips of 7 out of a total of 10 large roots had been broken at the logging road, thus cutting off many of the water absorbing root tips and throwing the tree badly out of balance. This might easily account for the decadence of the tree. Numerous roots one-eighth inch in diameter ran down hill and finally went vertically downward for about three feet into a water bearing conglomerate-like hardpan. Drawn with plane table like Nos. 2 and 3 on a scale of 2 feet to the inch. Two hundred and ninety living root tips were found and 55 dead ones, or 15.9 per cent of dead root tips. See Figure 7.

No. 5. Paper birch at Waterville, N. H. D. b. h. 6.2 inches. This tree was chosen as one showing the earliest stage of the trouble that could be detected with the tree still standing. There were very few twigs dead for about 6 inches; the leaves in the uppermost part of the crown were smaller than normal and had the edges rolled or curled inward. This was on a steep slope in a rather dry situation, with thin canopy but rather thick ground cover. No *Armillaria mellea* or borers were found. A portable fire pump was used about ten hours in washing out the roots; hand digging aided in loosening and removing the material. Dug July 25 to 26. Drawn with a plane table like Nos. 2, 3, and 4, on a scale of 2 feet to the inch.

This method of exposing the roots of such a tree is by far the more effi-

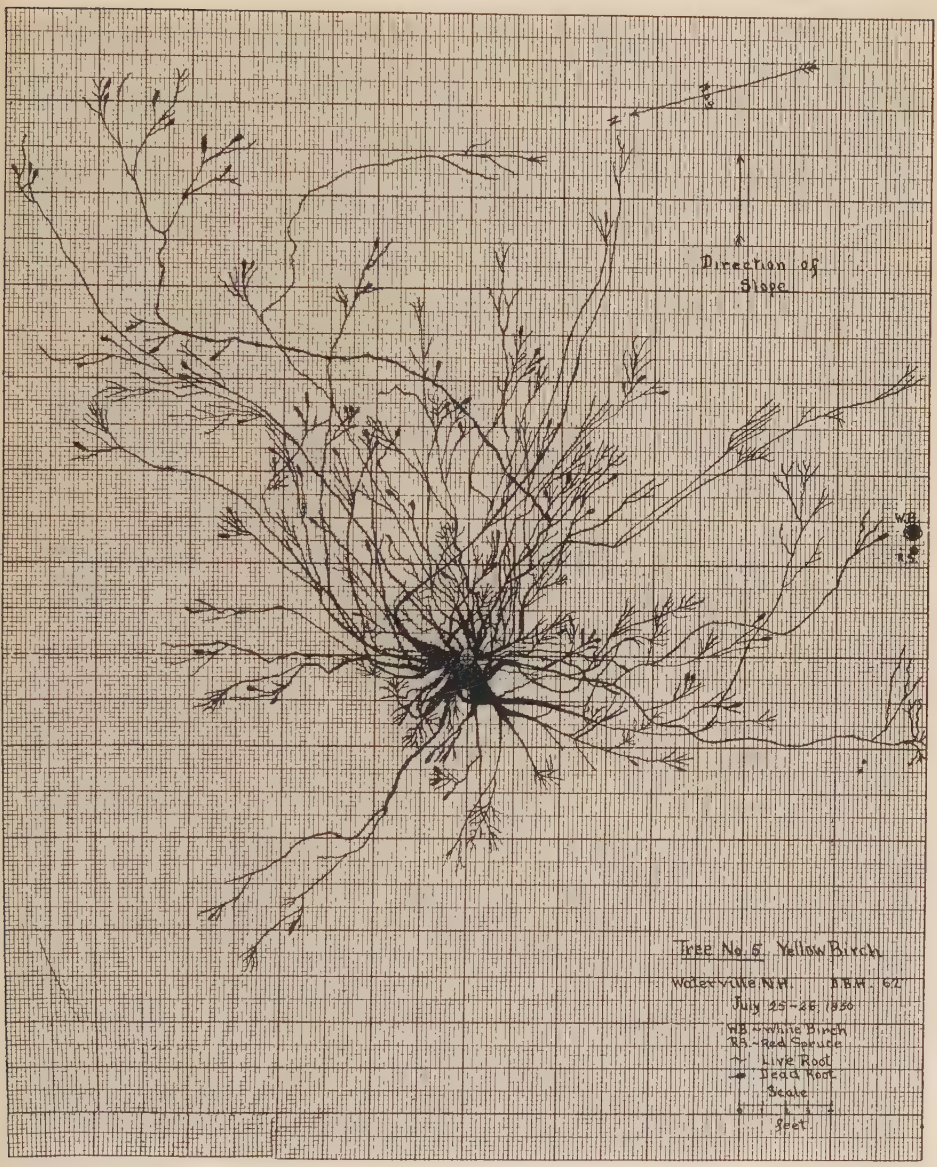


FIG. 8.—Drawing of root system of slightly decadent yellow birch. Tree 5 of series dug out. Roots washed out by portable fire pump.

cient, both in time required to do the work and in getting out the root tips unbroken. Four hundred and eighty-four living root tips were found and 94 dead ones, or 16.3 per cent of dead root tips. See Figure 8.

The examination of the roots of the five trees which were entirely dug out seems to indicate the following conclusions:

Under forest conditions, paper and yellow birch roots normally have some dead root tips. These are not as numerous in a moist situation as in a well drained one. A dry location leads to the production of a more extensive root system than a moist one. The roots extend far beyond the area covered by the crown of branches. In the gravelly sand of the glaciated White Mountain region where this work was done there is a very intense competition between roots of different species of trees, between roots of trees of the same species, and even between roots of the same tree. The distribution of the roots shows that even in this moist climate there normally is none too much water for the vegetation. The relative number of dead root tips showed no marked correlation to the decadence of the tree crown, but the number of trees is too limited for these data to be significant.

RESULTS WITH TREES FELLED BUT NOT COMPLETELY EXCAVATED

Insects. Of the 305 trees felled during the investigation 220 (72.1 per cent) were infested, in some degree, by the bronze birch borer. Examination showed that the borers aided materially in the death of 31 trees and the tops of 56 others, but in practically every instance decadence appeared to have started before the first attack of the insect. At least one dead tree could not have been weakened sufficiently by borers for that to have been the ultimate cause of death. Only 13 trees, or 4.3 per cent of the total number felled, which were attacked by the borers failed to show appreciable signs of decadence, and in 11 of these the larvae had died in the earlier instars. Previously it had been considered that the birch borer attacks always started in the upper crowns of the trees in branches at least a half inch in diameter and that the infestation progressed downward as the tree lost its vitality. This investigation showed that 94 of the infested trees (42.7 per cent) were first attacked in the lower stem; 41 attacks (18.7 per cent) were in the lower crown; 15 attacks (6.8 per cent) were scattered throughout the tree; and 70 attacks (31.8 per cent) were in the upper crown. Eleven of the 31 infested dead trees were first attacked in the lower stem, and 12 had the attack scattered throughout. In many of these trees the infestation in the first year was severe, and did not occur until the trees were in an advanced stage of decadence.

Apparently there is considerable overlapping of the life stages. Abundant evidence was obtained to show that in the majority of cases the life cycle of the bronze birch borer is not completed the first summer, but carries over into the early summer of the second year. Sometimes larvae from

eggs laid very late in the season may not pupate until the end of the summer of the second year and the emergence of the adults does not occur until two years have elapsed.[5] This means that a tree severely infested by succeeding generations will be greatly weakened and in such cases death is materially hastened. There does not seem to be any sure way of determining what trees are infested by the borers except by felling and peeling. Occasionally the raised welts are evident, but usually they are not noticeable, and as has been shown not all decadent trees are infested by this insect.

The associated insects taken included barkbeetles of the genera *Dryocoetes*, *Xyloterinus*, *Trypodendron*, *Pterocyclon* and certain flat-headed and round-headed borers. All are essentially secondary in nature and were only found on trees which had attained an advanced stage of decadence.

Generally speaking, primary forest insect enemies can be considered as those which attack perfectly healthy and sound trees and cause the chief or primary injury. Examples of these are the western pine beetle, *Dendroctonus brevicomis* Leconte, the mountain pine beetle, *D. monticolae* Hopkins, and the white pine weevil, *Pissodes strobi* Peck. Secondary forest insects, on the other hand, can be considered as those which are injurious in the sense that they assist other agencies in killing timber and rarely attack healthy trees. All evidence gathered during the course of this investigation shows that, in the areas where the study was made at least, the bronze birch borer must be considered as a secondary enemy, even though it may occasionally attack healthy trees. This does not preclude the fact that it is undoubtedly primary on shade and ornamental birches.

Diseases. The so-called "vascular" diseases of trees such as the Verticillium wilt of maples and the elm disease of western Europe which has just been discovered present in Ohio and which is said to be caused by *Graphium ulmi* Schwarz, cause discolored streaks in the sapwood of the affected trees. Because of the resemblance of the birch decadence in some respects to this type of disease such discoloration was watched for throughout the present investigations. The burrows of the borers *which were one or more years old*, and the adjacent sapwood, were blackened where the sapflow was plainly cut off between burrows. Some short, dark streaks extended lengthwise from these dead areas, but were always plainly due to cutting off of sapflow by such dead areas. While no discoloration of living sapwood was noted in the examination of the first 305 trees it was thought best to make sure of that point. Accordingly 75 additional paper birches in various stages of decadence, and in several localities in New Hampshire and Vermont, were felled and examined especially for such discolored sapwood. Paper birch was chosen because of its normally very white sapwood which presumably would emphasize any discoloration that might be present. Except for the above discoloration of old

[5] R. C. Hall in an unpublished report on his investigations of 1927 and 1928 calls attention to this fact.

burrows, no indications of a fungus were found.

Forty-three trees were found to have roots with exposed bark dead on the upper side. Everything indicated sunscald of bark which had been suddenly exposed by removal of canopy or of loose moss and duff. A study of these showed that the scalded roots were predominantly (30 trees or 80 per cent of all showing this injury), located on the southern and eastern sides of the trees. The exposures varied but the injury was correlated with exposure to the hottest early and mid-afternoon sun. Numerous instances were noted where the bare part of a root was scalded while a slight covering of duff entirely prevented the injury.

The results with *Armillaria mellea* infection were unexpectedly clear-cut. It was obviously impossible to examine the entire root system of hundreds of trees ranging in size from 4.5 to 20 or more inches d. b. h. To the senior writer it seemed fair to start with the premise that the health of a tree could not be seriously impaired by *Armillaria mellea* unless its attack was visible in one or more of the roots at or near the root crown or in the base of the tree itself. This could be false only if the fungus simultaneously attacked many or all of the roots of a tree, in which case enough of the absorbing rootlets might be cut off to materially decrease the water supply. But all attacks described in literature, which are quite numerous, show it making attacks only at one or two definite points. This agrees with all the evidence yielded by the present investigations. Of the 305 trees examined 53 were attacked by *Armillaria mellea*. In all cases the attacks was induced by a previous injury resulting in the killing of a patch of bark. There were one or two exceptions where it attacked a dead root which crossed and had partially grown to a living root or stump. Even in these cases there probably was some weakening of the bark of the living tree where an imperfect union had occurred. *Armillaria mellea* by no means attacked all subsurface injuries. Attack seemed to depend upon dead bark being located at or below the surface of the soil so as to remain damp but not wet. The attacked trees probably would finally succumb to the fungus, for after it once gains entrance it appears to become more aggressive in its action. The present investigation shows *Armillaria* to be saproyhytic until entrance to the tree is made. This was true also in those trees whose root system was completely exposed for examination. So far as this fungus is concerned, the decadence of birch primarily is due to injuries from other causes. The remedy is in avoiding those injuries.

On the dead twigs and branches of decadent birches the fungus *Libertella betulina* Desmazières constantly occurs. This fungus has been found universally on dead branches of yellow and paper birches in slash piles for several years. It is the first fungus to appear on dying birch slash and fruits in slightly more than one year after the living tree is felled. Because of its prominence as a slash fungus it has been studied closely. In no instance has it ever been seen acting

parasitically and it is believed to be a strict saprophyte which attacks only dying or dead birch twigs. It is not believed to be the cause of the death of the twigs in the crowns of decadent trees, but to enter them promptly when they die. It is common for the more abundant saprophytic wood rotting fungi to attack dead branches in the crowns of living trees of all kinds. *Libertella betulina* is exceptional in occurring constantly on dead twigs of living decadent birches. But it is no more constant there than on birch slash lying on the ground. Proof of its real nature should be made by inoculating living birch twigs with pure cultures.

Conclusions

1. In the stands studied the bronze birch borer can not be considered as a primary insect pest. There is ample evidence, however, that as decadence progresses the trees become more subject to attack and in many cases the borer is a contributing cause of death.

2. With our present knowledge, the decadence of birch could not be attributed to any fungus as a primary cause. *Armillaria mellea* undoubtedly helps to destroy trees previously injured by other factors.

3. The yellow birches studied were evidently suppressed under an over mature stand which heavily shaded them a long time. The sudden excessive opening subjected them to extreme light and heat on the uppermost twigs which they could not survive. The condition of the roots would not indicate marked inability to supply water, but the decidedly changed water conditions of the soil may prevent their functioning to maximum capacity in dry times.

4. The paper birch appears to have attained the age in these stands where it has lost its ability to sprout readily, and it was unable to recover after a long period of growth decline. Its incipient decadent condition was aggravated by the sudden release.

5. Remedy, so far as organic factors go, consists in preventing mechanical injuries, which largely furnish entry to *Armillaria mellea*, and in some places to the bronze birch borer.

6. It is suggested that relatively young trees should be chosen for release, especially of paper birch; and that yellow birch also must be released gradually. Cutting to a diameter limit may not result in leaving trees which are young enough for the purpose, as they may be of slow growth and are really older than is suspected.

SOME OBSERVATIONS ON SOUTHERN PINE SEED[1]

By PHILIP C. WAKELEY

Associate Silviculturist, Southern Forest Experiment Station

Miscellaneous, specific information on production, storage, testing, and handling of southern pine seed is brought together from the Southern Forest Experiment Station's files and the works of outside investigators. Individual peculiarities of longleaf, slash, loblolly, and shortleaf pine seeds are indicated, and the effectiveness of cold storage, modern cleaning, and moist, cold stratification to hasten germination, is emphasized. The need for more research in testing methods is clearly indicated. The article is not limited in interest to those concerned with southern pine.

RECENT PUBLISHED estimates of the area of southern pine land in need of forest planting range from 10,000,000 (15) to 33,500,000 (10) acres. In the light of the latest estimates by a number of state forestry organizations, the area seems to be somewhat above the smaller of these two amounts; probably 12,000,000 acres is conservative for the purposes of the present discussion.

Unfortunately, it is almost impossible to tell, even approximately, what percentage of this area is likely to be planted to each of the four principal species of pine—longleaf, slash, loblolly, and shortleaf. We have, however, fairly good figures for number of seeds per pound and for percentage of sound seeds, as well as for usual tree per cent in the nursery. The usual number of trees planted per acre in the southern pine region is about 900. Combining our average figures on seed, nursery results, and planting practice with such estimates as we have of areas that will be planted to each species, there is indicated an ultimate total seed requirement, for all species together, of approximately 2,500,000 pounds. It must be emphasized that this represents nothing more definite than an intelligent guess. More exact figures on areas, better technique, and possibly planting at wider spacing or in strips or blocks, may cut our present estimated seed requirements in half. It would, however, be less surprising to see them doubled, bringing them to a grand total of approximately 5,000,000 pounds.

If we are to avoid bungling the job of planting the 12,000,000 acres mentioned above, we must have sound information concerning the seed used. The necessary information falls naturally under the following five heads:

1. Inherent qualities of the seed.
2. Seed production.
3. Seed storage.
4. Seed testing.
5. Practical details of handling.

European studies have thrown considerable light on heredity among forest trees, and particularly upon the importance of obtaining seed from

[1]Read before the Gulf States Section of the Society of American Foresters at New Orleans, Louisiana, March 13, 1931.

localities with climates similar to the climates of the planting sites. The Swedish Forest Service, for example, uses no pine seed from localities the mean summer temperature of which differs by more than 0.5 degree C. (0.9 degree F.) from that of the proposed planting site (18). Büsgen and Münch (11) give a good general summary of European studies of forest genetics, and a number of additional references are made in the JOURNAL OF FORESTRY (28) and other American works (26).

During the past few years Austin, Bates, Coville, Hartley, Leopold, and Roeser have published in the JOURNAL OF FORESTRY a number of general articles on forest genetics. Bates (3, 4, 6, 7) has contributed a number of specific notes on the resistance of western yellow pine to cold, to rust, and to mistletoe damage, and its varying palatability to deer, together with data on variations in seed size, seedling growth rates and frost resistance of Norway pine from different regions. These articles, and especially Bates' contributions, indicate that hereditary variations are probably fully as important in American as in European species.

The Eddy Tree Breeding Station has sent into the Gulf States slash pine seed from three widely separated sources, one in Florida and two in other countries farther south. The results of this test were striking, showing clearly the superiority of Florida seed, in both growth and hardiness, when sown in Texas and Louisiana.

One nurseryman believes he has obtained a significantly higher percentage of crooked seedlings from shortleaf seed from central Louisiana than from seed of the same species collected in Arkansas. His statement is, however, based on mere observation, not on counts.

Reëxaminations of several thousand planted trees every year for the past five years have shown that there are striking individual differences in juvenile form and vigor, not wholly attributable to site, in trees grown from the same lot of seed, particularly in loblolly pine. Young trees of this species also show marked differences in reaction to infestation by the Nantucket tip moth, and it is probable that these differences are in part hereditary.

The Southern Forest Experiment Station has selected for breeding studies a number of slash and longleaf pines showing marked differences in gum production, and has established, partly through the help of the Louisiana State University's Forest School, a few matched plantations of four different species using seed from several different localities. The sources of seed of most of the commercial plantations at Bogalusa have also been recorded, together with a few others, though seldom in the detail desirable.

Further than this, no work on regional strains or individual variations has been done in the South. It seems highly probable, however, that with species whose habitats have mean annual temperatures ranging from less than 55 degrees to more than 70 degrees F., and mean annual rainfalls of from 40 to more than 60 inches,

regional strains will prove to be of considerable importance. Another point worth considering is the possibility of breeding a taller race of each of the southern pines. Despite their rapid initial growth, these pines can not compete with many of the northern and western conifers in total height, either in virgin timber or in second growth. Yet by constant selection of seed from the tallest trees, we might in time add a log length to the average height of many stands. Even one-half a log length would represent a considerable increase in forest productivity. Calculations (12) of the most "efficient" seed tree, which for a given cone production indicate the leaving of a short tree rather than a tall one containing more lumber, ignore entirely this matter of future forest productivity.

Table 1

AVERAGE VALUES FOR UNMILLED, COMMERCIALLY CLEANED SEED OF SOUTHERN PINES

Species	Number of seed per pound[1]	Per cent sound
Longleaf pine (*Pinus palustris*)	5,200	81
Slash pine (*Pinus caribaea*)	15,500	76
Loblolly pine (*Pinus taeda*)	21,300	61
Shortleaf pine (*Pinus echinata*)	69,200	57

[1]Based on a purity per cent of 100.

We have fairly satisfactory empirical knowledge concerning the yield of seeds per bushel of cones. These figures are based on seeds with the wings rubbed off and removed by winnowing in the wind or by an electric fan, except in the case of longleaf pine seed, the wings of which are remarkably persistent. Depending to a large extent on their quality and maturity, a bushel of unopened cones of any of the four principal southern pines may yield, after opening, 0.75 to 1.50 pounds of seed cleaned as described above. The usual average (29) numbers of seeds per pound, *based on a purity per cent of 100,* are given in Table 1. It is important to note that the gross weight of a lot of wind-winnowed or fan-winnowed seed must be reduced by multiplying by the purity per cent, determined by analysis of carefully-taken samples, if the above figures on number of seeds per pound are to be used. The purity per cent of good commercial lots of slash pine seed may be nearly 100; that of unwinnowed longleaf pine seed may be as low as 80 or 70.

Seed cleaned as described above, that is, without the use of modern, oscillating-screen, vertical-air-blast mills, contains a surprisingly low percentage with sound kernels. The average percentages, by species, based on all lots for which cutting tests are available, are given in Table 1. These percentages must be applied to the numbers of seed per pound already referred to, to get the maximum number capable of germinating under ideal conditions.

A brief consideration of these figures should not only save one the embarrassment of predicting too many seedlings per pound of seed sown in the nursery, but should suggest caution in calculating the adequacy of small numbers of seed trees, based on the observed cone production of those trees. For example, Chapman (12) gives an average of 60 fertile scales,

or 120 seeds, per cone of longleaf pine. If these cones were typical in size and in size of seed, and at the same time yielded 1.5 pounds of seed per bushel, with a purity per cent of 80, it is doubtful whether they produced much more than 50 *good* seeds per cone.

Although we have a fair amount of empirical data on seed yields, we are woefully lacking in data on seed production, on the factors which influence it, and on the periodicity of crops.

Chapman (12) and Forbes (15) have published some data on the sizes and forms of trees producing abundant cones; as a general rule, not much can be expected of any pine less than 10 or 12 inches d.b.h.

We have some slight evidence from the experimental area at McNeill, Mississippi, and from the state forest at Kirbyville, Texas, that protection from fire increases the production of seed in longleaf pine.

The toll of seed taken by insects is amazing. In 1928, on one longleaf pine at Bogalusa, Louisiana, insects of undetermined species destroyed nearly 125 one-year-old cones, and of the 128 flowers observed to have set in the spring of 1928, only three matured to form the 1929 crop. In the same year the larvae of a moth, *Dioryctria amatella* Hulst., destroyed considerable numbers of pistillate flowers of longleaf pine at McNeill, Mississippi, and for several years the same species of moth has been collected in the mature cones of longleaf and slash pines, from Florida, Georgia, Mississippi, and Louisiana. In 1930, of 8.5 bushels of slash pine cones from Slidell, Louisiana, 3.5 bushels were infested with larvae of *Dioryctria amatella.* Bushel for bushel, the infested cones yielded only 36 per cent of the amount of clean seed yielded by the uninfested cones. Variations in the amount of damage by insects may account for many of the vagaries of seed production.

All the seed records available at the Southern Forest Experiment Station have been analyzed to see what effect age of trees, locality of origin, rainfall during the summer in which the cones matured, and abundance of the crop, had upon the number of seed per pound and upon the percentage of seed with kernels. The data lack uniformity, and it is likely that some relationships have been obscured by variations in winnowing. The one relationship having any appearance of either definiteness or consistency was that between abundance of crop and percentage of sound seeds. For all four species under discussion, there was a distinct, though not always very striking, tendency for abundant cone crops to yield a relatively high percentage of sound seed. This finding suggests that the explanation of some seed crop failures may lie in poor pollen distribution. Pollen of any one species flies for so short a time that prolonged wet weather might conceivably ruin all chances of a crop. Incidentally, one may wonder if the sometimes poor cone production of widely separated seed trees left after logging may not be due to lack of pollen supply. The pistillate flowers are usually borne

above the staminate on the crown, and sometimes mature a trifle later on any one tree, and the "intensity" of a pollen flight from a neighboring tree must tend to vary as the square of the distance from the source.

Considerable doubt may be expressed regarding the soundness of such generalizations as "longleaf pine tends to produce a heavy seed crop every seven years." Data based on ages of successive "waves" of young growth are subject to error in age determination, and are markedly affected by drought, fire, and the like, which often prevent the establishment of seedlings despite abundant seed. We are confronted by anomalies such as heavy crops of longleaf seed at Bogalusa, Louisiana, in 1920, 1921, and 1927, with decidedly good crops in 1924 and 1929 (five crops in ten years), and with three good seed years in succession for young longleaf trees at Kirbyville, Texas.

A cheap, dependable method of storing seed for at least two years would make it possible to spread the surplus from good seed years over the lean years between, and to avoid undue loss, on the part of dealers, from seed not sold the year it is collected. If it develops that there are important regional or individual strains of southern pines, necessitating careful selection of seed, effective storage of seed will be doubly important.

Fortunately the same method which has worked well with European species, and which is receiving increasingly favorable attention among workers with American species (20, 8) in general, gives promise of working equally well with the southern pines. This is storage at low temperatures, preferably just above freezing. The JOURNAL OF FORESTRY for March, 1931 (30) contains a brief note on some of the tests recently completed with longleaf pine. Figure 1 gives the results of a more recent test, in which longleaf pine seed was stored for one year in a paper bag at 32 degrees F., with a control kept at room temperature, in New Orleans. The seed stored for a year at low temperature germinated fully as well and as promptly as the sample of fresh seed from the same original lot; the seed stored at room temperature, on the other hand, was far inferior in both rapidity and completeness of germination.

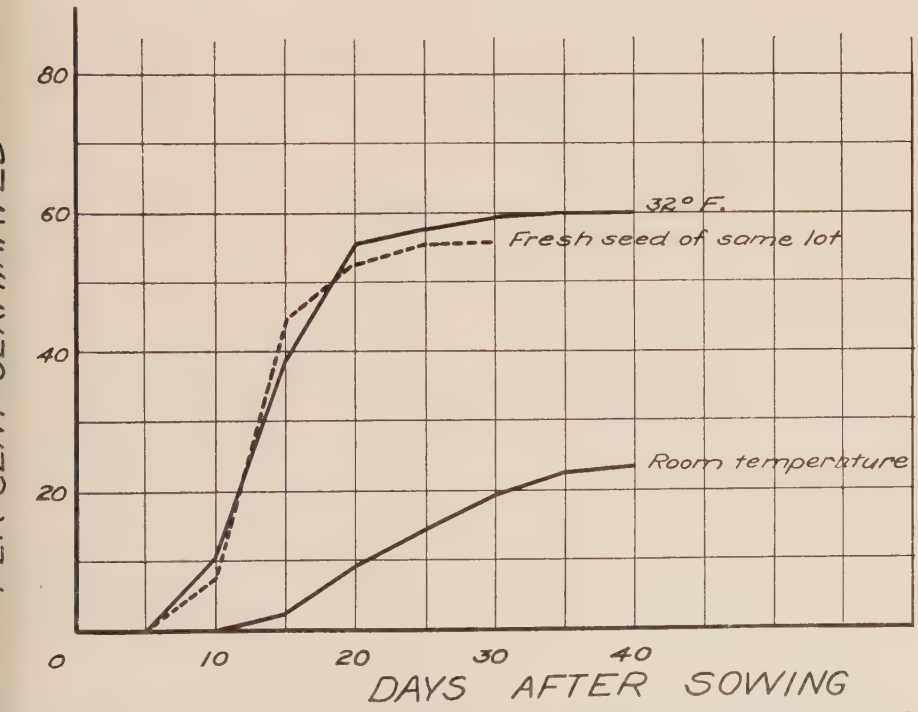
Because longleaf pine seed has a reputation for deteriorating rapidly, most of the storage tests of southern pine[2] seed have been confined to this species. A. D. Read, of the Long-Bell Lumber Company, has, however, brought shortleaf pine seed through for a year in cold storage, and obtained a final germination test of 71 per cent. There is no reason for supposing cold storage will be any less effective with slash and loblolly pines. Instances of failure with these and with longleaf pine have been quoted at various times, but it will usually be found that the seed which failed to germinate satisfactorily either was not put in cold storage until long after

[2]The author uses the term "southern pine" for the several southern species when mentioned collectively. *Ed.*

ollection, or was taken out of storage ome time before sowing, or both. In ne instance, seed originally intended or two beds was, through a misunderanding, spread over seven beds, and ne method of storage was later blamed or the resulting sparse stand.

In the storage tests conducted at the outhern Forest Experiment Station, here have often been found a large ercentage of apparently sound kernels hen the ungerminated seeds of a tored lot were lifted and cut at the nd of the germination test. This, ombined with the occasionally but ever consistently successful storage of eed in sealed jars, in covered garage cans, and in sealed jars after ormaldehyde sterilization, suggests ome factor other than temperature as possibly very important in storage. Moisture content of the seeds at the time they are put in storage seems the most likely, and moisture content at the time of sowing may be equally important in determining the course of germination of fresh seed.

The whole matter of seed testing, particularly of germination tests, is a complicated and vexing question, but, in one form or another, it is vital both to the administrative officer in charge of nursery work, and to the investigator in the fields of artificial forestation and natural reproduction. Seed testing for administrative purposes may frequently be reduced to a very simple basis of counts to determine number of seed per pound or unit of volume, and empirical study of germinability



IG. 1.—Effect of storage one year in paper bags on the germination of longleaf pine seed.

in which the chief requirement is fair sampling. Certainly several men, after a very few years' experience with southern pine seeds in their particular nurseries, *and using fresh seed,* have obtained excellent results by means of mere cutting tests or the more efficient "hammer test" brought to attention by A. D. Read. Research testing, however, is of a very different order, and after some extended experience with it one marvels at the blithe confidence with which forest school students and faculties alike pick master's-thesis problems in seed testing "because they will yield positive results within the year available."

Seed testing for experimental work requires both practice and adequate equipment. Makeshift equipment will not do; it results largely in disappointment and expense. Forest tree seed germination tests also require time, in periods far longer than those to which workers with agricultural seeds are accustomed, and all to attain final germination per cents which agricultural testers would consider far from satisfactory.

On visiting the testing laboratory of a large agricultural seed house a short time ago to view the germinator in use there, an opportunity was afforded to examine the records of several tests. The first one read: "Weight of lot, 1,375 pounds; number of seeds tested, 25; germination per cent, 100; period, 3 days." Another read: "Weight, 385 pounds; germination per cent, 45; period, 12 days; *dump*"—in other words, "throw the entire lot away." Our own records are full of tests in which germination never started until the fortieth day.

It is almost universally true that agricultural seeds germinate rapidly. The few garden or crop plants having seeds that are slow to germinate tend to be non-staples, and in addition are sometimes reproducible by vegetative means, like onions.

Space does not permit going into great detail concerning germination tests with seed of southern pines. The Southern Station and its various cooperators have tried sand flats, mixtures of sand and loam, moist paper in Petrie dishes, porous plates, and modified Jacobsen germinators carrying heating units and thermostats to regulate the temperature. Almost without exception the sand flat test, as we have finally standardized it, has given higher and more consistent germination, though often a trifle slower than any of the other media. It is by no means wholly satisfactory, and it is hoped to develop a still better method, but to date the sand flat has been the most reliable in every way.

The Southern Station's "standard sand flat" consists of a wooden box, $10\frac{1}{2} \times 10\frac{1}{2} \times 3\frac{3}{4}$ inches inside, filled with clean, moderately fine, white sand. The seeds are sown 200 or 250 to a flat, in drills of 25 seeds each, and the record of germination is kept separately by drills to permit certain refinements of statistical analysis. Each drill is sown immediately over a $\frac{3}{4} \times \frac{3}{4} \times 10\frac{1}{4}$ inch trough[3] of 1/16-inch mesh screen wire, imbedded in

[3]The idea of the troughs originated with Miss M. C. Regan, of the Southern Forest Experiment Station office. The troughs reduce by approximately nine-tenths the time required to lift ungerminated seed.

the sand, to facilitate lifting the ungerminated seeds for cutting tests at the end of the run.

A point to be emphasized particularly is that the seeds are covered only ⅛-inch deep, measured to their centers. This is less than the usual depth in sand flat tests made by other agencies, but studies both in sand flats and in nursery seed beds have shown conclusively that sand or soil coverings of ¼-inch or more reduce both rate and amount of germination of southern pine seeds.

Both the limited size of the flat, and the difficulty of covering the wings properly, makes it necessary to remove the wings of longleaf seeds by hand before setting up the tests.

No very detailed discussion of the results of particular tests can be given here. Figure 2, however, shows for each species an average curve based on all the available figures on rate of germination, in sand-flat tests of fresh seed not subjected to any special treatment such as kiln extraction at high temperature or sterilization by strong disinfectants. It is interesting to note that those for longleaf, slash, and loblolly pines are slightly better than the averages obtained by Toumey and Stevens with the same species (27). Probably the southern pine seed formerly supplied to northern workers did not always arrive in the best of condition.

With the exception of slash pine, the species show a total germination varying directly as the rate of germination. The rate of germination, in turn, varies directly as the size of the seed (inversely as the number of seeds per pound); see Table 1. There are many individual exceptions to the rule among our records, but they are usually explainable by some definite difference in treatment. The tendency of characters to vary as seed size varies in further borne out in the nursery, where we have had distinct evidence that the larger the seed of the species, the greater the resistance to injury by zinc sulphate on the part of the seedlings.

Average germination curves of the type shown in Figure 2 are of course suitable only for gross comparisons. They obscure many details, such as the slow start, rapid rise, and distinct break at the top characteristic of the curves showing germination of normal individual samples. Two such individual curves, one for longleaf and one for shortleaf, are plotted in Figure 2 as supplements to the average curves.

The slight inferiority of slash pine to loblolly pine seed in the matter of final germination is out of line, as noted above. Some light is shed on the problem, however, by the relatively high percentage (14-67 per cent) of sound seed found in cutting the ungerminated slash pine seeds at the end of the tests. Apparently something is wrong with our germination technique. This is further borne out by Figure 3, in which it is shown that the average of six tests in the nursery bed resembles more closely the best laboratory germination test than it does the poorest or the average of all tests.

At that, we have not utilized our slash pine seed to the best advantage. Figure 4 shows the same germination-test curves for slash pine as were

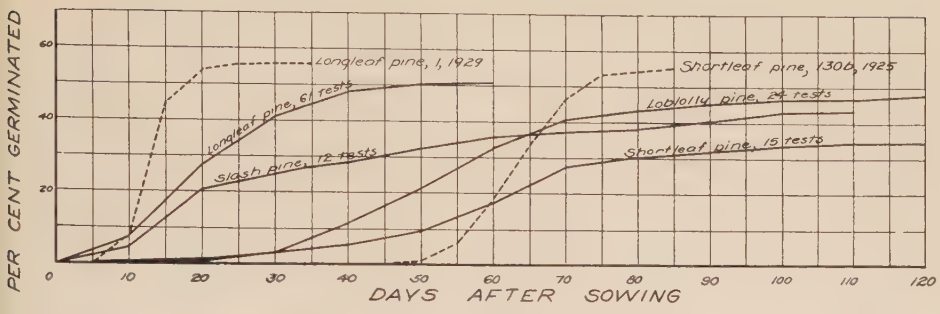
shown in Figure 3. In addition are shown Miss Barton's (2) curve for unstratified slash pine seed, which falls between the Southern Station's average and poorest, and, in striking contrast, her curve for slash pine seed of the same original lot stratified for one month in moist acid peat at 5 degrees C. Similar results were obtained with other species; loblolly pine seed, unstratified, germinated 41 per cent in 100 days, whereas after one month's stratification at 5 degrees C. it germinated 82 per cent in 22 days. At Miss Barton's suggestion, low temperature stratification of loblolly pine seed before sowing was tried at the Louisiana State Nursery in 1929, and was an important factor in producing uniform nursery stock.

Miss Barton's work with southern pines emphasizes the striking ability of longleaf pine seed to germinate at low temperatures. Longleaf samples stratified for one month at 10 degrees and 15 degrees C. germinated 54 per cent and 77 per cent respectively while still in the refrigerator, and longleaf stratified for two months at 5 degrees C. germinated 90 per cent before the end of the period. Haasis (17) found the optimum incubation (*i.e.*, germination) temperature of longleaf pine to be about 18 degrees C., which is below that of *Pinus rigida, P. resinosa, P. sylvestris, P. murrayana, P. ponderosa, P. taeda, Picea canadensis, Picea engelmanni, and Cupressus glabra.* (Yet longleaf pine had a second optimum at 46 degrees C. or above, higher than the secondary optima of any of the other species Haasis tested). The course of germination of longleaf pine seed in the nursery at Bogalusa, Louisiana, during the exceptionally cold winter of 1925-26, is shown in Figure 5, which also shows the maximum, minimum and mean air temperatures at the nearest weather station, averaged by five-day periods.

A certain background of facts and ideas is necessary to the picture of seed testing. One thing which should be emphasized, for instance, is proper sampling, which involves either manual or mechanical mixing of the seeds to insure even distribution of impurities and empty seeds. A single horrible example will suffice. Two flats, B and C, set up on successive days as parallel tests of a certain small lot of loblolly pine seed, gave final germinations of 64 per cent and 47 per cent. When the ungerminated seeds were cut, however, it was found that B contained only 20 per cent of empty seeds and C 41 per cent, so that the germination per cents based on total number of seeds with kernels were: B, 80 per cent, and C, 79.7 per cent.

Seed testing has its fair share of statistical pitfalls, some of which we may hope to avoid after we have mastered a recent circular by G. N. Collins (13), and similar works (16). Collins' circular is well worth study by anyone engaged in precise testing of seeds. Incidentally, it deals with determination of purity per cent as well as with germination.

What should prove a most useful tool in future work is the "referee test," which I understand originated with the Association of Official Seed Analysts of North America. The "referee test" involves a number of sam



——————— Average curves.
- Single sample curves.

FIG. 2.—Sand flat tests, fresh seed. Comparison of species.

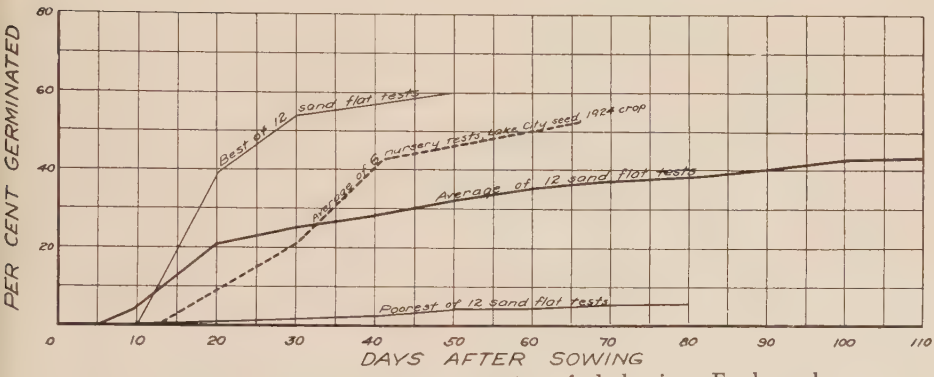


FIG. 3.—Nursery and sand flat germination of slash pine. Fresh seed.

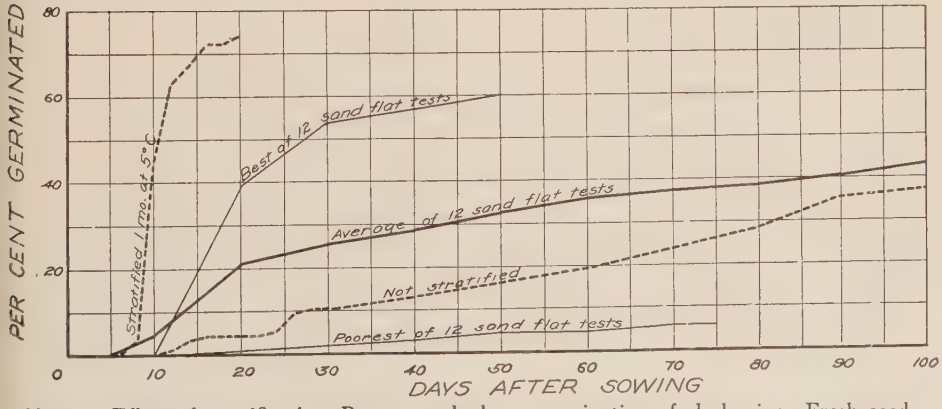


FIG. 4.—Effect of stratification, Barton method, on germination of slash pine. Fresh seed.

ples as nearly identical as possible, of a widely used variety of seed. It is designed to evaluate the work of various state seed laboratories, but not infrequently furnishes valuable information about the seed itself. The matched samples are sent to different laboratories for determination of purity and germination. The results of the tests are worked up by a central committee, sometimes with salutary effects upon laboratories whose work has fallen below standard.

The Association of Official Seed Analysts of North America is a professional organization of seed analysts employed in state seed laboratories and elsewhere. Its record of specific accomplishments appears most enviable. Collins' circular (13), the first American publication of its kind of which I have heard, was originally presented before the Association. The Association meets annually with the American Association for the Advancement of Science, and publishes a *Proceedings* well worth the specialist's perusal.

Certain sins of omission in seed testing deserve attention. A fortunately rare practice on the part of our coöperators has been the sowing of seeds without counting them, sending us the absolute numbers germinating, and leaving us to compute the percentages as best we could. Far more common is failure to make a cutting test of the seeds which do not germinate. This lapse is particularly unfortunate in tests of stored seed or of kiln-extracted seed, because it leaves one with no knowledge of the percentage of empty seeds, which, of course, no kiln temperature can harm and no storage method can cause to germinate. At one time or another, too, almost every agency neglects to obtain the germination per cent *when fresh* of seed which is later used for storage tests. This lapse weakens the data obtained from a partly successful storage method. On the other hand, if the stored seed failed to germinate, was it because the storage method failed, or because the seed was no good at the start?

Certain practical details in seed handling are worthy of mention. E. W. Hadley demonstrated in 1925, in connection with his work at the Southern Station, that seed of longleaf and loblolly pines could be extracted from the cones, efficiently and without injury, in lumber dry kilns at 120 degrees F. and 20 per cent to 30 per cent relative humidity, in 16 hours or less. We have every reason to believe the same treatment will work equally well with slash and shortleaf pines.

Superintendent Bean of the Kirbyville State Forest in Texas found it easier to collect cones in peach baskets than in the usual burlap bags. A great saving of time is possible on a collecting job if each man throws his cones into a half-bushel basket or measure, and then pours them into a bag, instead of trying to throw them directly into the bag.

Former State Forester Canterbury of Louisiana resurrected the old idea of removing the wings from seed by wetting. Except for the egregious longleaf pine, the seeds of the southern pines are so constructed that the two "claws" of the wing which grip the seeds relax

their grip when wet. Instead of painfully hand-rubbing seed, or running it through a complicated winging machine, the workmen wet it thoroughly, spread it on a canvas in the sun, and either knead it in a fold of the cloth or rake it vigorously with a stick at intervals during the drying process. (Incidentally, the first rain washes the newly fallen seeds of all but longleaf free from their wings, and thus not only aids their downward passage through the grass, but also makes them less conspicuous to birds. This can readily be tested with a watering can and a handful of freshly extracted seed.)

Among the recent practical developments in handling methods for pine seed, the use of good cleaning mills is perhaps second in importance only to Miss Barton's method of hastening germination (2). Such mills, ordinarily of the oscillating-screen, vertical-air-current type, remove practically all empties even from longleaf seed with the wings attached. Removal of empty seeds results in fairer values in trade and more uniform stocking in the nursery.

Where mills are not available, most of the empties can be removed from clean seed of any species except longleaf by means of the "witchcraft process." In days gone by, when witches were burned, persons suspected of witchcraft were bound hand and foot and thrown into a pond; if they sank they were innocent, but if they floated they were guilty. It is the same with seeds; the good ones sink and the bad ones float and can be removed.

So much for our information on seed source, production, storage, testing, and practical handling.

It seems to me that the further development of practical details of handling seed can safely be left to individual initiative, and that seed storage, which not long ago seemed a troublesome problem, need present no great difficulties in the future. These two subjects will probably take care of themselves.

In testing there is room for vast improvement. Miss Barton's work on hastening germination is a step in the right direction, but much remains to be done. The more highly technical tests should be rendered less uncertain, and more workable empirical tests should be developed for administrative use. The development of better testing methods is a job for specialists.

I am not sure whether we need a centralized testing agency in the South, especially now that at least one firm[4] in the United States does commercial testing, at so much a sample, but if we ever get a seed-labelling law for forest tree seed, we shall probably either have to furnish a central testing agency or call upon existing state seed laboratories to test tree seed in addition to agricultural seed.

With regard to inherent qualities of seed from various sources, I believe that it should be the personal policy of all professional forsters in the southern pine region to see that records are kept of the seed used in every planta-

[4]The Brown Company, Berlin, New Hampshire.

tion of southern pine. Where professional foresters are in charge of planting, they should keep such records themselves, systematically, and as scrupulously as though they were under oath. They should urge planters who are not foresters, such as farmers and owners of estates, to keep similar records, and give them every assistance. Some seed record should be kept for every acre planted, even if it be so homely as a sheet laid away in the family Bible, with the words: "To Whom It May Concern—I got the seed for my slash pine plantation in my back pasture from John Jones, of Lake City, Florida, in January, 1931." The more nearly universal our records, the sooner we shall arrive at the truth concerning the importance of regional strains. I might add that the report on seed source, sent out by some dealers with each lot of seed, needs only the addition of a few lines on the location of the plantation, etc., to become an excellent seed source record for a plantation.

Trade in forest tree seed is legitimate business, and seed dealers, whether foresters or not, are entitled to a fair profit, and to due margin for the considerable risks involved. I do not believe, however, that it can be considered ethical to attempt to corner the market in any species, such as slash pine, or to conceal sources to prevent competition for the services of collectors. The important thing is not the profit on the immediate transaction, but the speed and cheapness with which the acreage of bare land is reforested. Misbranding or misdating seed is of course fraudulent under any circumstances.

Furthermore, seed collection, or more exactly, seed crop reporting, is a

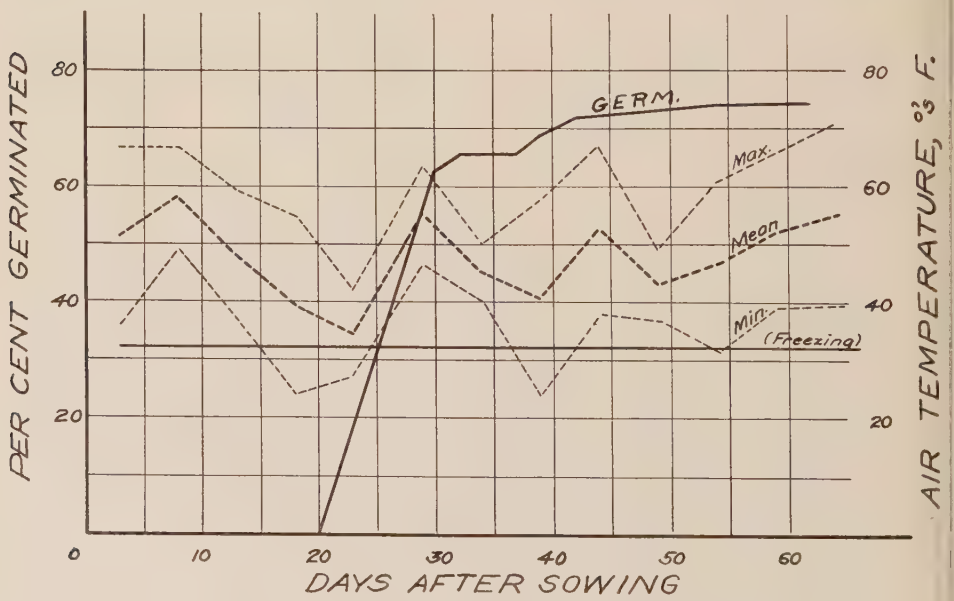


Fig. 5.—The course of germination of longleaf pine seed in the nursery.

legitimate and suitable field for group action on the part of professional foresters. In the southern pine region in particular, there should be an intersection committee, with members from the Ozark, Gulf States, Southeastern, and Appalachian Sections, to organize the reporting of cone crops each year by all members of the Society of American Foresters working in the pine types. The abundance of cones should be reported early in August, to permit summarizing data before slash pine seed ripens in September. All prospective logging jobs in bearing stands should be noted. Names and addresses of local collectors, especially those of experience and established reputation, should be listed up to date. Special effort should be made to find stands of apparently superior strains, made up of trees of exceptional form, growth rates, quality of wood, productiveness of gum, or resistance to insects and disease (5). This information should be whipped into shape and redistributed to the members of the sections concerned. Such a crop-reporting service, properly conducted, would be a credit to the sections and to the Society as a whole, and would certainly be of immense help in the collection of the 2,500,000 odd pounds of southern pine seed mentioned at the beginning of this paper.

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WESTERN YELLOW PINE SEED EXTRACTION IN THE BLACK HILLS

By J. F. CONNER

Forest Supervisor, Harney National Forest

A simple seed extraction plant depending on natural drying is described. Though the process is not rapid it points to a moral: that "efficiency" is not necessarily correlated with intricate equipment and speed and that the simplest means are often the best and cheapest.

THE BLACK HILLS region of South Dakota, because of its geographic location and accessibility, has been the source of western yellow pine seed for the Forest Service nursery at Halsey, Nebraska, for more than twenty years. During this period many improved methods of collection and handling have been developed. Seed collecting on an extensive scale was undertaken in 1910. Ten thousand bushels of cones were purchased from local residents of the forest who gathered them from squirrel hordes. A large part of these were open-air dried on canvas but there was not sufficient time before winter set in to get all cones dry enough to open. It was therefore necessary to move the cones inside and to use artificial heat.

The first extractory was an old barn in which a large heating stove was set up. The cones were placed in trays arranged about the stove. By keeping up a hot fire it was possible to dry out the cones nearest to the stove so that they would open in two or three days after which the trays would be shifted so as to expose all the cones equally to the heat. This method was slow and required much handling but labor was abundant, the scale of wages low, and labor saving devices not so highly developed as at present.

The first constructed extractory in the Black Hills was built in 1912. It consisted of a dry kiln fitted with steam radiators. The steam was secured from an electric power plant located about 100 feet from the kiln. A blower was used to draw off the moist air before it became saturated during the drying period. With the temperature of the kiln kept at approximately 110° F. and the air changed at intervals of from two to four hours, cones would open in from thirty-six to forty-eight hours. This method of opening the cones was very satisfactory for a few years, but the radiators then began to leak steam and the power company from which the steam was secured did not run its plant a twenty-four hour period. This necessitated using extra fuel to keep up steam during the portion of the day when the plant would not have been operated. Consequently the company discontinued furnishing steam for this purpose, at the end of the contract period. The radiators were then removed and an ordinary hot-air, pipeless furnace installed under the kiln. This had one advantage; the cones,

after the seed was extracted, supplied the furnace with fuel and no longer had to be hauled away. There were, however, many disadvantages. With the furnace located in the center of the kiln it was difficult to keep the heat circulating. The cones in the trays nearest the furnace register would become too hot for maximum germination of the seed while those at the ends were not heated enough to open. To provide sufficient heat the furnace was fired almost to capacity, which created a high fire hazard, in fact, the extractory was destroyed by fire in 1924.

For the next two years, cones were dried on canvas and then run through a hand cone-shaker. This shaker consisted of a sixteen-foot piece of two-inch pipe as a shaft and a cylinder of one-half inch mesh wire thirty inches in diameter fastened to the shaft by means of spokes made of two-by-fours. The shaker was then supported by braces at each end, the brace at the entrance being slightly higher than that at the foot in order to allow the cones to travel slowly from entrance to exit as the shaker was turned. Due to the uncertainty of weather conditions in South Dakota, open-air drying on canvas did not prove very satisfactory. A building was therefore designed to protect the cones from the weather during the drying process and also to provide sufficient air circulation so that the cones would dry out and open without the use of artificial heat. The floor plan of this building embraces 24 x 50 feet. The south side is open and covered with rodent-proof galvanized wire. On the north side approximately one-third of the surface is covered with rodent-proof wire and fitted with tight doors hung from the top and opening outward so as to keep snow from blowing into the building and still provide good circulation. Instead of boarding the roof to the peak, one foot on each side of the ridge is left open and a second roof constructed two feet above the first to provide better ventilation.

When the cones are received in the fall they are placed on trays measuring six feet long, three feet wide, and four inches deep. A cleat is nailed across each corner to provide a space between the trays when they are stacked. The trays are stacked in tiers, fifteen trays high, arranged in rows spaced from eight to twelve inches apart to provide for air circulation. Only two bushels of cones are placed on each tray in order to give the cones enough ventilation to prevent moulding and to insure each cone opening. A great improvement in the trays could be made by using two-inch sides instead of four-inch, with a one-inch cleat top and bottom. It would provide better circulation of air and would increase the capacity of the extractory since the trays would occupy less space and eighteen trays could be placed in a tier instead of fifteen.

The cones are received about the middle of October and are placed directly upon the trays. In normal years they dry out enough by March so that the seeds which have not dropped out of the cones in the process of drying can be extracted by running the cones through the shaker. No storage bins are provided; therefore, the capacity

of the extractory is limited to the number of cones that can be put on the trays at one time. There are 500 trays in the building at present, which gives room for one thousand bushels of cones and still leaves room in one end for the machinery used in extracting and cleaning the seed.

The present shaker, located in the basement of the drying-room, consists of a cylinder of galvanized iron sheeting. It is eighteen feet long and thirty inches in diameter and is supported at either end by shaft hangers, a few degrees off horizontal, so that the cones may slowly travel along as it rotates. At either end there is a strip of one-half inch mesh screen through which the seeds may fall into containers. Rotation is furnished by an electric motor. The speed is sufficient to give the cones a thorough shaking, but of course, not great enough to cause centrifugal force to hold the cones against the walls of the cylinder. The empty cones are transferred from the mouth of the shaker, by means of a blower at the outside where they may be disposed of.

The seeds are taken from the containers and placed in the "winger." This machine resembles a three-foot ice cream freezer in a nearly horizontal position. The paddles, however, are tipped with heavy latigo leather, so that their rotation will not damage the seed but will rub off the wings. In operation the winger paddles rotate slowly, the leather scraping against the smooth walls of the cylinder. A third of a bushel of seed is put into the upper end and then allowed to travel down to the mouth. As the wings are broken from the seeds, the seeds drop into the fanning mill which is a standard grain fanning mill equipped with a special screen. It is necessary to run the seed through the fanning mill twice in order to clean them thoroughly. The threshing and cleaning of seed from a thousand bushels of cones, ordinarily requires five days' work from two men—three days for running the cones through the shaker and two days for cleaning the seed and replacing the trays.

The advantages of this type of extractory are that the system is "closer to nature" than when artificial heat is used. The cones have an opportunity to ripen fully and open gradually, thereby producing seed without imparing germination, and at a lower cost than if treated by artificial heat. The cones are placed in the trays and require no further attention or expense until they are ready for threshing. When they are dry enough so that the scales will snap instead of bend when one's finger is run over them, they are ready for threshing.

The cost of cones for the past five years has averaged thirty-five cents per bushel delivered at the extractory. On an average, slightly more than one pound of seed can be extracted from each bushel of cones.

The cost of cleaned seed from this extractory ranges from 70 cents to 75 cents per pound, including an annual depreciation charge of ten per cent on equipment amounting to from 20 cents to 30 cents per pound depending on the amount of seed extracted. Excluding depreciation, it is possible, with the open-air type of extractory, to secure western yellow pine seed at approximately fifty cents per pound.

PRELIMINARY OBSERVATIONS ON THE USE OF CLEAR CUT STRIPS IN HANDLING BLACK SPRUCE[1]

By T. SCHANTZ-HANSEN

Forester, in Charge, Cloquet Forest Experiment Station

The results of cutting in strips in a swamp of mature black spruce is described. Windfall proved to be heavy in the uncut strips, but reproduction was found to have entered satisfactorily although more heavy in the uncut than in the cut strips.

BLACK SPRUCE (*Picea mariana*) is an important forest tree in Minnesota. It occurs commonly on swampy sites which, for the present at least, must be considered as forest lands of low value. On such sites it grows slowly. Very little information exists concerning the rate of growth or the silvicultural systems applicable to these stands, nor has a successful planting technique been developed for them. Because of its slow growth and the difficult site upon which it occurs, any experimental cuttings which have resulted in good natural regeneration are of particular interest.

Black spruce is an important pulpwood species in Minnesota. In 1926, the paper industry of the state used 233,868 cords. Large quantities are shipped each year to mills in Wisconsin and Pennsylvania. It is the backbone of the newsprint industry in this region and it is an important element in the manufacture of other grades of paper.

Three black spruce types occur in sphagnum swamps on the Cloquet Forest; pure stands, a mixture of black spruce and white cedar, and a mixture of black spruce and tamarack. The swamps are all acid in character. The root system is invariably shallow, making the tree very susceptible to windthrow.

The black spruce begins to produce seed at from 15 to 20 years of age. Because the cones are serotinous, there is usually a supply of seed on the trees. It is unusually tolerant of shade, being second only to balsam fir in this respect.

Black spruce stands are often even aged and are doubtless the result of reproduction from seed. Reproduction by layering is also of importance, but when stands originate through layering they are uneven aged. Layering is probably of more importance in open stands and on poorer sites where the branches have a tendency to persist to the base of the tree. In young stands, origination from seedling layering often causes an increase in the number of stems per acre, especially during the early years of the stand.

The tree's shallow root system, its tolerance. its serotinous cones and its habit of layering, together with the

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unfavorable seedbed and the poor quality of the site, must all be considered in determining its proper silvicultural treatment.

Description of the Stand

In 1927 it was noticed that a considerable number of trees were dying in a 120-year-old stand of black spruce on the Cloquet Forest. The cause of death could not be determined. It did not seem to be due to fungous disease. For a number of years there had been a slight deficiency in the precipitation, but not enough to seriously lower the water level in the swamp. This stand was quite dense, varying from 600 trees per acre in the open portions to 1000 per acre in the dense portions. The trees averaged 6 inches d. b. h. and 50 feet in height. Because of the density of the stand, very little underbrush was present. The ground cover consisted largely of sphagnum moss, Labrador tea and leather leaf. Swamp birch and alder occurred in the more open spots.

The peat is relatively shallow in this swamp, averaging four feet deep. It is underlaid with a layer of hardpan about one foot thick. The stand appeared to be somewhat more thrifty than the average black spruce of the north, probably because of the shallowness and condition of the peat layer.

Description of Cutting

A partial cutting of the stand was made, following a system of cutting in strips. The uniformity in size of trees and the danger of windfall made the use of a diameter limit or any other type of selective cutting impractical.

The strips ran in a northeasterly direction, or at right angles to the prevailing wind. The seven clear cut and seven uncut strips were each about 75 feet wide. All dead and down material was removed from the uncut strips. The slash was lopped and scattered.

Results

In determining the relative merits of a silvicultural system, its effect on the remaining stand must be taken into consideration, as well as its efficacy in establishing a new stand.

The original cutting was made in February, 1927. One hundred and twenty cords of pulp-wood were cut from approximately five acres. Four growing seasons have elapsed since then, giving time for the reproduction to come in and for indictating the probable eventual fate of the uncut portion of the stand.

An examination of the uncut portion of the stand was made in the late fall of 1930. At that time, 17 per cent of the total number of trees remaining had been windthrown, 15 per cent were dead, and 68 per cent were still standing and alive. Most of the windfall occurred during the summer of 1930, but the dying out had been gradual during the four seasons. As the dead trees and windfalls were distributed uniformly among the diameter classes, the percentages given above apply to the volume losses as well as to the number of trees.

From the standpoint of the remaining stand, the strip system has not been an unqualified success. A 17 per cent loss through windfall is rather heavy even when it is spread over a four-year period. The loss thru dying may be disregarded, since it was apparently not caused or in any way affected by the cutting. Unusually high winds do not occur in this region every year, but such windstorms as commonly occur come in the spring and in the summer when the ground is soft and the trees are most susceptible to windthrow. As the stand was mature and the crowns were small, no increased growth was expected from opening the stand.

From the standpoint of the reëstablishment of the stand, the method has been very satisfactory, although, as will be brought out later, the excellent reproduction which has resulted may not be entirely due to the method of cutting. Forty-five mil-acre plots were laid out in the clear cut strips and in the uncut strips. The entire area averaged 10,888 seedlings per acre. The clear cut strips averaged 9,333 seedlings per acre, while the uncut strips averaged 12,762 per acre. It should be remembered that the uncut strips were narrow and allowed a great deal of side light to enter. The increase in light, together with the supply of seed available in the serotinous cones, are the factors which probably account for the heavier stand of reproduction found in the uncut portion of the stand.

The slash, which had been lopped close and scattered, did not have any detrimental effect on the reproduction. The density of brush, however, seemed to bear an important relationship to the number of seedlings per acre. Areas having a brush density of zero averaged 57,000 seedlings per acre, while those of 0.6 density averaged only 2,500 per acre.

Practically all of the reproduction came in after cutting. Only 5.4 per cent of the seedlings examined were advance reproduction, while 50 per cent of them germinated in 1929, the third season after cutting.[2]

Very little is known about the optimum conditions for the natural reproduction of black spruce. Kenety[3] attributed the lack of seedling reproduction in spruce swamps to the saturated condition of the soil, the low soil temperatures during the germination period, and the lack of mineral soil and sunlight. All of these are no doubt contributing factors. He further contends that even though a seedling did establish itself for a year or two, the moss might grow up around it and smother it. In many instances this may no doubt occur, especially in relatively dense stands of mature spruce.

The swamp in which the strip cut-

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[2]Two-year-old seedlings cannot be considered fully established. Their general appearance and vigor indicate that they should survive; many of them have leaders from 4 to 6 inches long developed during the second growing season. Even though there should be a mortality of 50 per cent, the area would still average over 5,000 seedlings per acre. Natural losses will in a measure be offset by layering.

[3]Kenety, W. H. Reproduction of black spruce. Jour. For. 15: 446-448. 1917.

FIG. 1.—Strip cutting in progress in 1927. Dead material not yet removed from the clear cut strip.

ting was tried has been the source of sphagnum moss used in shipping of nursery stock from the Station nursery and for the past twelve years from three to five wagon loads of moss have been gathered each year from it. Only fresh green moss was taken, leaving the partially decayed moss exposed. The partially decayed moss without doubt offers a better seedbed than the green moss. Moreover the growth rate of the moss undoubtedly has been sufficiently slowed up by the removal of most of the living portion to prevent smothering of the seedlings.

It is possible that the removal of the moss may have contributed to the death of the trees. Since the best reproduction was found where the moss had been gathered, and since in an adjacent uncut stand reproduction was found to occur only where the moss had been gathered, it may be inferred that the removal of the moss was an important factor in the reëstablishment of the stand.

Conclusions

While no very definite conclusions can be drawn from this single example, which was somewhat complicated by other influences, it does seem to indicate that clear cutting in strips may be a successful method of reproducing swamp stands of black spruce where all the timber is mature and where the remaining strips may be removed in the next five yeas.

The need for a preliminary treatment to improve the seedbed seems to be indicated.

"Accelerated erosion" is erosion of soil increased above the rate which existed before land was cleared or burned over. Increased silt and sediment in streams are direct evidence of increased superficial run-off of rain from a slope, which means that conditions have been brought about that have diminished the absorption rate of the soil on a watershed. Such accelerated erosion, with the resulting increase in amount of débris carried by the waters, means not only the rapid ruin for human use of the land eroded but also that the rate of silting up of artificial reservoirs will be much more rapid. Shortening the life of reservoirs will mean that their annual cost will be increased, and financial hardship, or even bankruptcy, possibly brought upon irrigation districts or other agencies paying for them.

Forest Rangers' Catechism.

THE EFFECT OF PURE CONIFEROUS STANDS ON HARDPAN FORMATION: A HYPOTHESIS

By ELDRED R. MARTELL

Junior Instructor in Forestry, University of Michigan

The dangers of planting conifers in pure stands under some circumstances are great enough to outweigh the economic desirability of pure forests. One such danger is the possibility of producing hardpans which will ultimately reduce the yields. The author points out the processes that are likely to bring this about. He suggests that the greater acidity of the percolating waters under a pure coniferous forest causes more rapid solution of the iron and aluminum compounds and their concentration in the subsoil to form hardpan than the less acid solutions percolating the soil under mixed forests.

FOR THE LAST ten or fifteen years a great deal of interest has been shown in forest plantations. Through the coöperation under the Clark-McNary Act (3) and the examples of both federal and state forest departments, this enthusiasm has manifested itself in numerous plantations of pure conifers. The Federal Government in the Lake States has planted large areas to pine. Similar plantings have been made by the state departments, notably Michigan (8). The State of New York, in its recently adopted land acquisition program, apparently intends to follow the same plan (3).

All of this enthusiasm has been aroused by the incessant publicity given to forestry. We have started an irresistible force in our behalf. It is of paramount importance to the interests of the profession and posterity that foresters guide this force. To accomplish the greatest benefit it must be guided by the best principles of forestry. Foresters as a group are aware of the possible disaster falling upon pure forests, and yet the planting of pure and mixed coniferous stands goes on.

We are all familiar with the destruction caused by the nun moth in the spruce stands of Germany and Czechoslovakia. In our own country forest entomologists point out the possible consequence of such specific insects as the white pine weevil and the pine tip moth in pure stands. The results of such diseases as root rots, blights, and rusts, both in Europe and the United States, need no added emphasis. In a word, both entomology and pathology show the grave consequences to which pure coniferous stands may lead.

As early as 1820 Cotta (13) warned his Saxon colleagues of the possible grief to which they were laying themselves open in the planting of pure coniferous stands. But because of the immediate financial returns in short rotations of spruce for pulp and mine props, his warning was not heeded. However, after a series of such rotations the results are apparent even to the uninitiated. Dr. E. Wiedemann, in 1924, published the results of a study of these practices and he showed conclusively that production in pure spruce stands had decreased considerably in

comparison with spruce grown under a shelterwood of beech (15).

We are indebted to Russian (5, 10) soil scientists for our present system of major soil classification. This system of classifying soils is based not so much upon the parent rock from which the soils were derived as upon the effect of climatic factors on the original materials. Because Russia is so large a country with so varied a range of climates, this scheme of soil classification based on the mode of soil formation first became apparent to their soil workers. With the exception of local influences its principle is applicable throughout the world for the major climatic soil groups.

It has been shown (12) that at an average temperature of 25° C., or above, an accumulation of organic matter does not take place, provided the soil is well aerated, *i. e.*, not saturated with water. In other words, temperatures above 25° C. are more favorable for the destruction of organic matter by microörganisms than for the production of organic matter by the higher forms of vegetation. At temperatures below 25° C. the reverse is true, that is, megavegetation finds better optimum temperature conditions for its life activities, while the microörganisms are now restricted, with consequent slowing-up of decomposition. Thus in regions where the temperature is below 25° C. an accumulation of organic matter takes place. Since the presence or absence of organic matter (*i. e.*, litter and humus) greatly affects the characteristics of a soil, it can readily be seen that temperature has a profound indirect influence on soil.

In the lowlands of the humid tropics where there is little or no accumulation of organic matter, we find the so-called laterized soils. These are the well-known red soils of equatorial lowland regions. They are formed in the following manner: Rainwater falling upon the vegetation and soil, percolates downward devoid of suspended or dissolved organic matter. This water at first dissolves, carries away and removes from the soil the easily soluble alkali and alkali-earth metals, such as potassium, calcium, sodium, magnesium, and others. Then it will attack and remove silica, iron, and aluminum, which make up the bulk of all mineral soils. In such percolating waters, silica is relatively more soluble than iron oxide or aluminum oxide, so that in the long run the soil will have a greater percentage of the latter substances left. The preponderance of iron oxide remaining in these soils gives them their characteristic red color.

In the humid regions of the temperate and cold latitudes the foregoing process is reversed. That is, in a climate, such as ours, we find precipitation entering the soil charged with organic matter either in molecular solution or as a colloidal sol. In this water percolating through the soil and charged with humic acids, iron and aluminum oxides are relatively more soluble than silica, while, of course, the alkali and alkali-earth metals are subject to ready removal, as before. Thus after comparatively long or short intervals we find the upper layers of soil approaching a grey color because of their lack of ferruginous material. This is called podsolization and results eventually in the formation of a "pod-

sol"—a term adopted from the Russian language, meaning an ashen grey soil.

However, the iron and aluminum material dissolved or suspended in the acid percolating water may not be carried to great depths, and the following is the accepted theory of its re-deposition: The humus in the percolating water may be in either the molecular or colloidal state. Humus in percolating water is usually considered to be in the colloidal state (1). Since the resulting reaction is the same in either molecular or colloidal state, it is best to consider both. If it is a molecular solution, then the dissolved material is more or less dissociated and since it is acid (7), there are free hydrogen ions present with positive electric charges. The colloidal particles in a humus sol are also usually positively charged (1). Iron and aluminum compounds when in a colloidal sol likewise carry positive electrical charges (6). This is important, because when two sols with like charges are mixed the resulting sol is more stable. Conversely, when two sols with unlike charges meet, the result is the precipitation of the colloidal material to form a gel. Thus the positively charged humus sol mixing with the positively charged mineral colloids forms a more stable sol. But whether in solution or sol we have positively charged ions or colloids and when these come into the presence of negatively charged material, such as the alkali or alkali-earth metals, precipitation must occur.

The humus-charged water in its downward percolation sooner or later reaches a soil layer where the alkalinity is great enough to cause precipitation. In the event of the alkaline material being concentrated at a given depth successive precipitations give rise to an accumulation of iron and aluminum oxide gels. These oxide gels act as a cement in binding sand and gravel particles together, and thus form the so-called "hardpan", little pervious to water and plant roots.

In general, all soils in humid regions increase in alkalinity with depth. Strictly speaking then, the development of hardpans is possible in all these soils. In the Lake States in particular another factor is present.

The glacial soils of some parts of the Lake States contain large amounts of lime picked up by glaciers as they rode over great bodies of limestone. This is particularly true of the soils about Ann Arbor, Mich. In a climate such as that of southern Michigan, an accumulation of this lime at given depths is possible. The percolating water from snow and spring rains dissolves out the lime and carries it deep into the soil. Such of this dissolved lime as reaches the water table may be carried away and does not enter into our consideration. Much of this solution, however, remains in the aerated zone of soil and it is the portion in which we are interested. The capillary movement of water brought about by the hot dry weather of summer starts this solution upwards through the soil. Where the small passages in the soil are broken up by stones or boulders, capillary action at that point ceases, or at least is greatly diminished. Upon meeting stones or boulders the solution is stationary and the lime is concentrated at that point. When the capillary water is not so

interrupted it continues to rise to the zone of the root activity. At this point plant roots remove large amounts of water leaving behind the lime. To be sure, plant roots take up small quantities of lime in solution. But where the lime content is high not all of it is so used (11). In forest plantations the stand is usually even-aged, which means that all the tree roots will be competing for water at approximately the same depth in the soil. It is clear from this that the deposition of lime at the root level will be great. Under forest cover the amount of capillary water that reaches the surface to be evaporated is relatively small. It follows then that the lime will either be concentrated about capillary obstructions or at the zone of root activity. With the accumulation of lime at these points the remaining condition of hardpan formation is fulfilled.

The concentration of acidity in a humus soil is dependent upon the type of humus through which the percolating water passes. Frank (4) in Germany has pointed out that coniferous humus as a whole is decidedly more acid than is deciduous humus or mixed forest humus. It is true that the acidity of the humus of different conifers varies. Hemlock humus, for example, is ordinarily only slightly acid, whereas spruce humus is usually decidedly acid. This, in turn, is more true under a complete forest canopy. In acid litter and humus fungi are the organisms credited with bringing about decomposition of the organic matter (2). The fungi in many cases actually increase the acidity, their mycelia causing a matting of organic matter, which decreases the aeration. This matting and its resultant increase in acidity in turn decreases the speed of decomposition. With the accumulation of organic matter due to lower temperature, the inherent acidity of coniferous material and the activities of fungi a decidedly acid humus must result. The ability of the percolating water to dissolve iron and aluminum compounds depends on its acidity. It follows, therefore, that under these conditions the solvent capacity of the water for iron and aluminum compounds is greatly enhanced.

In a deciduous or mixed forest, a decidedly different condition occurs in the litter and humus. The hardwood humus is in itself less acid (9). Because of the shape and size of hardwood leaves, the mechanical packing of the litter is not so great, resulting in better aeration. Both aeration and less acidity are favorable factors for biological decomposition. Fungus activity is greatest within a certain range of acidity, and bacterial activity increases as the medium approaches neutrality (14). Then with a speedy decomposition of the organic matter the percolating water is less concentrated with humic acids. Under these conditions the amounts of iron and aluminum compounds dissolved by percolating water is much less. Accordingly, the danger of hardpan formation is appreciably diminished in hardwood forests.

The above discussion has pointed out the processes that are likely to bring about hardpan formation. The speed of formation of the hardpan is dependent upon the intensity of these processes. The presence of lime or other basic materials in the soil cannot be controlled. However, we can

control the rapidity with which iron and aluminum compounds are dissolved in the upper soil layers. The intensity of the process is dependent upon the acidity of the percolating organic solution. The acidity of this solution is higher in pure coniferous stands than in mixed or deciduous stands. Thus pure, even-aged, coniferous stands offer the best opportunity for the development of detrimental hardpans.

From the foregoing it is clear that the planting of pure coniferous stands on such lime-containing soils can have but one ultimate result. It is true that such a result would probably be evident after most of us are gone. Nevertheless, such a result would constitute a reflection on our professional skill and would mean that our present heroic efforts at reforestation were largely wasted. It, therefore, behooves foresters as a group to seriously consider the possibilities of promiscuous planting of pure coniferous stands.

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PLANTING VERSUS DIRECT SEEDING OF YELLOW POPLAR IN THE SOUTHERN APPALACHIAN REGION

By C. F. KORSTIAN[1] and A. L. MACKINNEY[2]

Appalachian Forest Experiment Station

Any information which points to the proper method for growing the valuable yellow poplar is welcome. The authors tried both direct sowing and planting and found the latter to be far superior for the conditions of the test. Information is also given on the production of poplar seedlings in the nursery.

THE OUTSTANDING value of yellow poplar (*Liriodendron tulipifera* L.) for timber production in the Southern Appalachian region arouses interest in the practicability of establishing it by planting or sowing on areas where it has not reproduced naturally. By artificial methods it should be possible to reforest with yellow poplar many abandoned fields and cut-over lands that are thinly stocked with inferior saplings. Reasoning from the fact that poplar reproduces abundantly by seed, artificial seeding would appear the logical means of establishing stands. Experiments were accordingly undertaken to determine the relative merits of direct seeding and planting. The results indicate nearly complete success for planting but practical failure for all the experiments in direct seeding.

The experiments were conducted at several places with elevations ranging from 2,000 to 3,000 feet on the Pisgah National Forest and on lands of the Champion Fibre Company, in western North Carolina. During the spring of 1927 one hundred spots were sowed with yellow poplar seed on each of five different sites as follows:

1. An east-facing slope from which all timber had been removed the preceding year.

2. A north-facing slope from which all shrubs as well as trees were removed at the time of establishment of the spots.

3. A cove bottom which had been practically clear cut the preceding year.

4. A north-facing slope in an abandoned field.

5. A south-facing slope in an abandoned field.

The seed spotting in the abandoned field was repeated in 1928.

The seed spots, eight feet apart each way, were prepared by clearing the sod from a square about two feet on a side and pulverizing the soil with a mattock. The seeds, which had been collected the preceding fall and stratified between layers of moist sand over winter, were broadcasted at the rate of about 75 per spot and covered with about one-eighth inch of soil.

For comparison with the seed spots

[1]Formerly Senior Silviculturist, now Director, Duke Forest, Durham, N. C.
[2]Assistant Silviculturist.

yellow poplar seedlings were planted on each of the above-mentioned sites except the first. From 100 to 500 one-year-old yellow poplar seedlings ranging from 0.7 to 1.2 feet in height were planted on each site. In planting, an area two feet square was cleared of sod and a hole dug large enough to accommodate the roots. The seedling was set in the center of the hole and the soil firmed around the roots. The seedlings were planted eight feet apart each way.

In addition, two already existing plantations were studied, one on a west-facing slope which had been clear cut the year before planting, and the other on a west-facing old field.

Survival of Yellow Poplar Seedlings in Seed Spots and Plantations

Table 1 compares the precentage of planted seedlings that remained alive at the end of each growing season for four years, with the percentage of seed spots that contained seedlings at the same time.

The germination in the seed spots on all areas was quite satisfactory, but the seedlings grew very little the first year. The root systems were weak and poorly developed and most of the seedlings were uprooted by the alternate freezing and thawing of the soil during the first winter after the establishment of the spots. Most of the stand present at the end of the second growing season germinated the second spring from seed which had been held over the first year. During the ensuing winters losses by frost heaving continued to be heavy, although not so large as during the first winter. At the end of the fourth growing season an average of only 40 per cent of the seed spots contained seedlings. Observations indicate that in a few more years less than 20 per cent of the spots will support seedlings.

Compared to this poor survival, that in the plantations has been very good, averaging 95 per cent at the end of the third growing season, and observations indicate that very little additional loss is to be expected.

Table 1

SURVIVAL OF SEEDLINGS IN SEED SPOTS AND PLANTATIONS

Area	Seed spots containing seedlings				Survival in plantations			
	1st yr.[1] Per cent	2nd yr. Per cent	3rd yr. Per cent	4th yr. Per cent	1st yr. Per cent	2nd yr. Per cent	3rd yr. Per cent	4th yr. Per cent
Clear cut, east slope	100	---	62	20[2]	---	---	---	---
Clear cut, west slope	---	---	---	---	98	97	97	94[3]
Clear cut, north slope	78	84	59	34	97	97	97	---
Clear cut, cove bottom	81	82	48	39	95	95	95	---
Old field, north slope	86	94	76	44	94	94	92	---
Old field, south slope	64	95	79	61	96	96	91	---
Old field, west slope	---	---	---	---	99	99	97	97
Average	82	89	65	40	97	96	95	95

[1]At end of growing season.

[2]Less than 10 per cent after sixth growing season.

[3]87 per cent after seventh growing season.

Height Growth of Yellow Poplar in Seed Spots and Plantations

The height growth of the planted seedlings is compared in Table 2 with that of the seedlings in the seed spots. The seedlings in the seed spots grew very slowly and were of poor vigor through the entire period covered by the experiment. The planted seedlings, on the other hand, were vigorous and grew rapidly.

During the year in the nursery previous to field planting the seedlings attained heights ranging from 0.7 to 1.2 feet and developed strong, fibrous root systems. For the three years following field planting the rate of annual height growth of these seedlings did not increase materially while they were becoming established, but even then they grew *six times* as fast as the seedlings in the seed spots. However, during the fourth year after planting the seedlings on the only two planted areas studied grew thirteen times as rapidly as the seedlings in seed spots.

Planting—The Best Method of Reproducing Yellow Poplar Artificially

When survival and growth of planted seedlings are compared with that of seedlings growing in seed spots it is evident that planting is by far the more satisfactory method of obtaining stands of yellow poplar artificially.

The seedlings grown in prepared seed spots were very small and of poor vigor four years after seeding, and the stand on the seeded areas was sparse and scattered. The areas planted with one-year-old seedlings were well stocked with thrifty young trees four years after planting. The planted trees, because they had well developed tops and root systems when they were field planted, were able to withstand the rigors of the planting sites much better than the seedlings germinating in the seed spots.

Growing Planting Stock

Aside from the state forest services there are at present few sources from

Table 2

AVERAGE ANNUAL HEIGHT GROWTH OF SEEDLINGS IN SEED SPOTS AND PLANTATIONS

Area	Seed spots				Plantations			
	Average height growth in feet				Average height growth in feet			
	1st yr.	2nd yr.	3rd yr.	4th yr.	1st yr.[1]	2nd yr.	3rd yr.	4th yr.
Clear cut, east slope	0.10	0.10	0.30	0.30	----	----	----	----
Clear cut, west slope	----	----	----	----	0.50	0.44	0.78	1.14
Clear cut, north slope	0.10	0.05	0.04	0.02	0.38	0.32	0.30	----
Clear cut, cove bottom	0.08	0.05	0.06	0.09	0.32	0.26	0.20	----
Old field, north slope	0.07	0.10	0.04	0.04	0.36	0.38	0.27	----
Old field, south slope	0.05	0.03	0.03	0.07	0.34	0.26	0.20	----
Old field, west slope	----	----	----	----	----	0.89	0.92	1.40
Average	0.08	0.07	0.09	0.10	0.38	0.51	0.53	1.27

[1]After field planting.

which yellow poplar planting stock can be obtained. Persons who wish to plant yellow poplar may therefore find it necessary to raise the planting stock themselves. The methods found to be most satisfactory are given in the following paragraphs.

The seed may be obtained from seed dealers or preferably by gathering the strobiles or "cones" from yellow poplar trees in the autumn just before the seed falls. A logging operation offers excellent opportunities for collecting seed. After the seed is collected the strobiles should be dried just enough to permit the seeds to loosen and fall apart. Care should be taken not to let the seeds get any drier than necessary, since drying causes loss of viability. At best the germination per cent is very low, ranging from 5 to 30 per cent. There are between 10,000 and 18,000 seeds per pound.[3]

The seeds, as soon as received from the dealer or loosened from the strobiles following collection, should be sown in the nursery or stored by stratifying between layers of moist sand. Fall sowing in the nursery is more satisfactory since it eliminates the necessity of using special storage methods over winter.

The seed may be sown in the nursery beds either in drills or by broadcasting. Broadcast sowing is not so satisfactory as drill sowing, since the seedlings are sensitive to crowding and competition for moisture which is less pronounced in drill-sown beds. It is usually satisfactory to plant the seeds in open beds except where rodents are a menace to the seed before it germinates, when it becomes necessary to enclose the beds with frames covered with wire screens.

The seeds should be sown at the rate of about 50 to 75 to the running foot of drill, in rich moist soil. This will give an average of 5 to 10 seedlings to the running foot. The rows should be eight to twelve inches apart and the seed should be covered with about one-eighth inch of soil. The rows should then be mulched with dry leaves or rye straw to prevent the drying out of the soil over winter. This mulch should be removed in the spring before germination starts.

If it is impossible to sow the seed in the autumn it should be stratified between layers of moist sand and kept over winter in a cool moist place. In the spring the seeds may be screened from the sand and sown in the nursery.

During the first growing season the seedlings will reach a height of one-half foot to one and one-half feet. Before growth starts the following spring, usually during March or early April in the Southern Appalachians, the seedlings should be dug and field planted.

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[3]Toumey, J. W., and Korstian, C. F. Seeding and planting in the practice of forestry. 507 p. 1931. John Wiley & Sons, New York.

FACTS

By H. H. CHAPMAN

Yale Forest School

The writer replies sharply to *Miracles* which appeared in this Journal in March and contests the major arguments of Mr. Boyce, its author. Mr. Chapman draws upon his own extensive experience and wide knowledge of matters concerning forestry policy to give a different viewpoint of the theory of public land acquisition for forestry purposes and of public fire protection.

THE ARTICLE entitled *Miracles* by Charles W. Boyce, published in the JOURNAL OF FORESTRY for March, 1931, may possibly represent the opinions of others beside its author. At any rate it deserves a reply. In this article the writer will endeavor as far as temperamentally possible, to stick to facts. Sarcasm and ridicule are two-edged swords which "children" should not handle carelessly lest they cut themselves. The statements and assumptions in the above article are so numerous that a digest is attempted.

The points in the summary follow roughly the order of presentation of these ideas in the aforesaid article. They will be discussed in the same order. If the abstract does not represent the thoughts expressed in the article, the writer apologizes for his failure to interpret them and may be considered, in this case, as answering his own points.

1. Foresters have been chiefly concerned in slaying a mythical giant dubbed "timber famine," to the neglect of the one essential of forestry, namely, fire protection.

Reply: In spite of rail and water transportation, which tends to make this country an economic unit, and in spite of the depressing temporary effect on lumber prices of cheap cargo rates to the Atlantic Seaboard, the exhaustion of *regional* supplies of timber produce the economic effects of a timber famine, these are, practical cessation of local supplies, increased "marginal" prices for lumber and wood products for local use, and the unavoidable invasion of cheaper substitutes. Today, and for some time past, a "timber famine" has existed in the Lake States, so severe as to curtail new farm construction and lower conspicuously the per capita use of lumber and wood, by reason of price alone. At $60.00 per thousand board feet, common lumber in famine regions is a luxury. The effort to supply a national commodity largely by exploiting a virgin store of timber located thousands of miles from the consumer, by rail, is an economic fallacy which it should not require 100 years more to discover.

2. Fire protection is practically the whole of forestry and other matters can wait indefinitely.

Reply: Fire protection is the most important of several measures required in forest production, but the

idea that protection alone will restore the forests to even a considerable proportion of their original productiveness, in the absence of all other forestry measures such as protection against insects and fungi and the leaving of seed trees or young timber of the better species, does not accord with experience in any region. This statement illustrates the dangerous logic employed throughout the article, in which a single panacea for an economic and physical disease is advocated by the method of discrediting any and all others possible remedial measures.

3. Fire protection is wholly and exclusively a public, and chiefly a national function, with no responsibility resting on the private owner.

Reply: It is a pleasure to observe the sweeping and profound character of the trust placed in the national and state governments, in the recommendation that fire protection is wholly and irrevocably a public function. State Forester Bunker, of Alabama, by contrast, claims that it is more efficiently handled as a private function. We agree that fire protection for any region demands unification and coördination of all agencies, under public control, but differ when it comes to relieving private owners of all responsibility, financial or otherwise. Is the author familiar with the Maine system of taxation for fire protection, and with the constantly extending plan of assessing individual owners for state-controlled coöperative fire protection through associations of land owners? Does he wish to set aside the principle of the Clarke-McNary law and relieve private owners of all responsibility for fire protection? Efficient widespread fire protection can never be achieved until private owners and the public at large coöperate whole-heartedly in an united effort to control fires.

4. Purchase of land for public forests by the federal government is the foresters' cure for a timber famine.

Reply: If, when and where a scarcity of timber appears, it can be met in one of two ways, first by paying freight on lumber from the Pacific Coast, Russia, the Amazon, or some other distant region and restricting consumption to those uses which will stand the transportation costs, and second, by waiting until young forests, if any, mature to merchantable sizes. The author evidently believes that the latter plan will work provided fire protection alone is adopted. The present writer, as long ago as 1899, in Minnesota, came to a different conclusion. There was nothing mythical or legendary about this conclusion. It was based on conditions as he had studied them, at first hand, in the Minnesota pineries. This was the logic. Fire protection regardless of the best efforts the state could put forth over 20,000,000 acres of land largely cut over was bound to prove insufficient in itself as a practical measure for an indefinite future period. At present, 32 years after, this prophesy holds good, and the state through making tremendous progress, has not yet mastered the problem. The national government at the time was capable of

far more effective organization against fire, and if given an opportunity, could by the probable success of its efforts, demonstrate the possibility and the results of fire protection for this great forest region. After 32 years this prophesy also has been fulfilled. The Chippewa National Forest at Cass Lake, created in 1902, is already practically under a sustained yield from timber whose destruction by fire was prevented by federal efficiency, while practically the entire area of cut-over lands are restocked, largely with valuable conifers. Similar results are being attained on the Superior National Forest. As Mr. Boyce says, "it is our job to do those things which are up to our generation to do, i.e. to lay the groundwork." That is what the writer tried to do in Minnesota, in 1902, and today the citizens of that region feel that the start then made was a wise one. Every progressive measure in forestry in the region has either been inspired directly by this demonstration of the possibilities of forestry, or has been profoundly influenced by it. Since there is plenty of time, it may even come about that these public forests will produce full grown trees before the state or any private company undertakes forestry on a large scale. Meanwhile, the citizens of Cass Lake are a unit in support of this National Forest, regarding it as the backbone of their economic prosperity. One hundred years from now other local communities in this region may prosper from private forest production untrammeled by government competion.

5. The origin of the "apurchanistic" heresy is attributed wholly to the sycophant attitude of forestry "yes-men" toward some mythical leader or leaders who in a bygone era pronounced this policy to be the real thing.

Reply: Dr. Joseph Trimble Rothrock, in Pennsylvania, was the author of the "apurchanistic heresy" and in 1898 after twenty years of economic study was the first to inaugurate this purchase policy in the United States, for *public forests*, after considering and rejecting at that time all other means of solving the state's problem of dealing with forest denudation. At the same time, he devoted all his ingenuity to the problem of controlling forest fires throughout the state, but with very little effect. He did *not* put all his eggs in one basket, nor announce to the world that forest fires must first be stopped, before any money was diverted from this objective and wasted on the buying of land for public forests. As a direct result, the state finally solved the problem of forest fire protection *by reason of ownership* of over 1,300,000 acres of purchased forest land. How? First, because forest fires, and money to fight them, require public support. Public interest was first aroused through pride in the ownership and enjoyment of the benefits of public forests. Second, because the state forests were put under a trained forestry personnel, and it was but a step to extend their authority, as district wardens, over the remaining private forest lands of the state. Third, because it was discovered by the state game commission that game

refuges were capable of restoring the game to Pennsylvania forests, and that the state forests were available for such a purpose. The game was restored, and the 500,000 hunters of the state were added to the supporters of public forests and enemies of forest fires. Fourth, the tremendous and increasing use of the state forests for recreation brought the city dwellers in contact with the forests and they joined the ranks of fire enemies.

In New York a similar history was enacted. The success and extension of state fire protection originated and spread from the Adirondack Park. On the other hand, Mr. Boyce's theory found an early advocate in Alfred Gaskill, former state forester for New Jersey. Mr. Gaskill could even have furnished the copy for the Boyce article. In pursuance of the one idea that fire protection came first, the then existing established policy of New Jersey of buying land for state forests was abolished, yet down to the present, fires have continued to get out of bounds in New Jersey despite praiseworthy efforts to control them. Of recent years, public sentiment in the state has increasingly demanded the extension of public forests, which now will cost many times what they might have been acquired for twenty years ago. *Money alone* will not stop forest fires, and may even breed them. Too much money to fight fire, in advance of public sentiment, defeats its own purpose by encouraging incendiarism in order to secure employment. Only when public sentiment goes hand in hand with increased appropriations for fire protection are results secured commensurate with this use of public funds. If, as stated, fire control is a public function wholly and irrevocably, it is the *public* to a much greater extent than the land owner, which will pay for this protection. What do they get out of it? Give them public forests, and the money will be forthcoming, as the facts of forestry history have shown.

But who started the national purchase policy? Not Gifford Pinchot, or H. S. Graves, nor B. E. Fernow, nor Filibert Roth, nor any other of those leaders vaguely alluded to, whose "word was law" and deprived their satellites of the power of independent thought. The national purchase policy was the result of exactly the same public pressure and demand which recently secured the enlargement of the state parks in New York to include over 4,000,000 acres, taking in practically all the forest land in the Adirondacks and Catskills. It was the same demand which recently caused the comparatively poor states of Virginia and Tennessee to appropriate millions of dollars to buy land to present to the government for national parks. It was the demand for unlimited prohibition of all forms of commercial operations, over as much area as can be secured, the demand behind the National Park Service in their original efforts to relieve the Forest Service of many millions of acres of national forests, the demand that caused one, Willard Van Name, to write a book called *Our Vanishing Forests* in which he advocates the prohibition of lumber logging

on the national forests, a book full of inaccuracies similar to those appearing in *Miracles*.

There is nothing mysterious about the origin of this movement to anyone who cares to ascertain facts before indulging in speculations. The rôle which foresters played—not the older but the present generation, for this child was born in 1911—was to divert the torrent of public enthusiasm into the same channel of national forest acquisition, as was done in Pennsylvania and failed in New York. Had it not been for this guidance, the White Mountains and Appalachian National Forests would have eventually become national parks or remained as private lands. The forestry profession has not always successfully ridden the wild horse of public demand for *public lands* for parks, but what it has accomplished in this direction is vastly to the credit of the profession.

6. Foresters regard all private timber owners as vandals.

Reply: The impression that lumbermen and timberland owners are vandals is beside the point, and incidentally cannot be laid at the door of the forestry profession. We were not of the impression that lumbermen *as a whole* had as yet adopted measures which could be called forestry or which would restore the forests. Even fire protection is, according to the author of *Miracles* no responsibility of the land owner but of the public. Yet he holds that the public must agree to spend no money except in protecting lands, which they do not own, from fire, with no guarantee from the land owners as to the remaining necessary measures for forest restoration.

7. Wood is struggling for existence as a commodity, because of the low price of substitutes.

Reply: As to the future use of wood, this *is* jeopardized by the low price of substitutes. The cure suggested is to wait until substitutes become more expensive, and then everybody will suffer equally and there will be no relief from high prices. A little economics is a dangerous thing apparently. But while we are speculating on the future, it might be possible that a more effective way to maintain the use of wood is to eliminate excessive freight charges by producing the regional supply within each region, and to insure its continuous use by raising enough of it in the region to maintain a large-scale industry on the basis of stable and ample raw materials. This formula worked well while the virgin forests were supplying a local or regional demand, and might work again. Incidentally, what cure shall be adopted for over production in oil, farm crops and automobiles? The lumber industry on the Pacific Coast is not the only one whose ox is gored. Would their problem disappear if production could be limited to the capacity of the West Coast forests for a sustained yield? *Is* the *total* annual wood consumption decreasing, or only the per capita consumption, and is or is not this a result of eastern *timber famine* and freight charges?

8. Fire protection has lost its romantic appeal and foresters are hunting new mythical giants to slay.

Reply: The "romantic" appeal of fire protection is apparently as strong as ever, and, chiefly because it has developed as an integral part of a well rounded program and not as a giant to be slain by some bean-stalk climber, the progress made is increasing annually in a geometric ratio. For facts, consult the records of the Forest Service and of the states.

9. Funds appropriated for purchase of national forests serve to reduce the amounts which would otherwise be available and appropriated for fire protection.

Reply: The idea that funds appropriated for purchase of lands diverts funds for fire protection is belied by the records. Only when the Weeks Law was passed in 1911 providing funds to buy lands for national forests was the first appropriation made for coöperative fire protection. Forestry is a unified program, and in every civilized country, a basic plank in that program is public ownership of from one-fifth to one-half of all the forest lands. With three per cent of the eastern forests in public ownership, the wonder is that as these eastern states have secured as much money as they have for fire protection. The answer probably is that the fire program is borne on the shoulders of the general reputation of the national forests and Congress is willing because of this sentiment, to support fire protection. One man's opinion is as good as another's on such a hypothesis. Possibly the record of private owners as a whole for practicing forestry is so good that the government would prefer to spend the money now used in land acquisition to paying for fire protection on private lands, in excess of what is now being spent. *Or possibly,* if the Nation spent twice as much on land purchases, there would be twice as good a chance for increasing the funds for fire protection. I prefer the latter conjecture based on observations of past trends, in state and national forestry.

10. Public purchase and ownership of forests does nothing for timber production which could not be accomplished on a far wider scale by fire protection *as a public function on private lands.*

Reply: This has been partly answered under (5). To state that acquisition of public forests results is no change in the forest presupposes that there is nothing in the art and practice of forestry, which apparently is the opinion of the author of *Miracles.* On the contrary, the writer has seen the direct results of forest practice on the Chippewa National Forest, contrasted to the widespread deterioration and destruction of the forests surrounding that area. He has watched the ruin of a great area of longleaf pine cut-over lands lying south of Urania, La., by the removal of seed trees for poles, and has seen this process stopped and the forces set in motion for successful reforestation of this area, following its acquisition by the federal government. He believes that professionally trained foresters, when placed in charge of forest land, whether public or private, can work wonders in restoring the forest growth on these lands, *because they have al-*

ready done it. Public ownership reasonably insures such management. Not a leaf may stir because of the transfer of title, but a good many leaves may stir and rustle in the breeze of intelligent management, including concentrated, efficient and successful fire protection.

11. Planting alone is like a fleabite on an elephant when it comes to solving the problem of erosion.

Reply: A forester should not attempt either to exaggerate or belittle facts. Planting in some regions is necessary in order to restore valuable species—for example, in the former pineries of the Lake States. The writer was not aware that any forester advocated planting as a universal panacea for the control of "dat new plant disease what dey calls erosion," and the profession is fully aware of the widespread influence and importance of natural cover in controlling this evil.

12. National production of timber involves competition with private production, so dangerous that it would tend to eliminate private forestry, and

13. Private forestry as for instance, in Louisiana and the Lake States, would logically be discontinued directly as the result of the establishment of national forests in those regions.

Reply: Here is raised again the "giant" of public competition in forest production, which some bean-stalk climbers prefer to slay rather than the evils of unregulated production, waste of a virgin resource, over capitalization, cut-throat competition and other more familiar bogeys, which have, by the lumber industry been "first endured, then pitied, then embraced." A little more thought in backing up Col. Greeley in his efforts to solve some *real* problems of the lumber industry would provide a good antidote to this case of nerves. Or perhaps a trip to Sweden, France, Germany or other government-ridden countries might throw light on the subject of competition in timber production between public and private owners. But as this again invades the field of economics in which it is open season for ideas at present, the writer will merely reiterate the position he has taken in two published text books. This is that by and large, public forestry, in the long run, not only *does not* serve to discourage private industry in forestry, but is the *strongest factor in making private forestry profitable.* (See article by A. H. Crane in the March, 1930 number of the JOURNAL OF FORESTRY, page 306, for experience in Australia as bearing on this subject.) As to the establishment of national forests in Louisiana discouraging private forestry, Henry Hardtner, the foremost forest conservationist in that state and the pioneer of forestry among the lumbermen of the south, states that he waited until the national forest was established and demarcated north of Alexandria, and then acquired over 20,000 acres of land adjoining this forest, because he felt that with federal example and support it was possible to control fire on this area and make a success of growing longleaf pine.

14. Everything but fire protection can wait a century or two until we become wise enough to understand

what we should have done about it now!, and

15. Future *total* national as well as and in addition to per capita consumption, is probably going to be at a much lower figure than present consumption.

Reply: What does the future hold in store? The probable answer is, just what we make it hold. If man can so profoundly alter the processes of manufacture as well as the face of nature, he can devise means of utilizing all the accessible wood we can grow. Or do we believe that production, meaning harvesting of wood, has permanently outstripped consumption? The same credulity displayed in believing in the invention of substitutes for all uses of wood might be spread to include the use of wood itself. Why not? Let the poor gander share the sauce. It is certainly a "tough break" that unrestrained private exploitation of West Coast forests has run on the rocks and that costs of transportation have acted as a barrier to unlimited use of wood at $60.00 per thousand feet, boardmeasure and we wish it were otherwise. But the Chinese may become peaceful and modern and absorb all the surplus. Who knows? Meanwhile it does take quite a while to grow trees and there has been a notable lack of enthusiasm on the part of private owners in many cut-over regions to undertake this enterprise. The public may in the future be quite complaisant about securing home grown instead of Pacific Coast timber. In fact, the Coast may find an export market by water for all it can profitably grow.

16. The federal government by waiting indefinitely, can get all the national forests it wants, blocked out, in suitable forms, "either square or round" and without cost, through arrangements by which the states and counties agree to present the Nation with delinquent tax lands and waive all claim to back taxes or other compensation.

Reply: The U. S. Forest Taxation Inquiry, with which the writer is still connected, could not substantiate Mr. Boyce's predictions as to free grants of tax delinquent or any other class of lands from state to Nation. The tendency is all the other way at present.

17. There is a great question as to whether all of our idle acres should be put to work, and the true solution for the present is to entrust the entire problem to private owners to develop the best lands on their own initiative.

Reply: While admitting the existence of many millions of acres of submarginal lands, too poor even for the national government to spend money on for the production of timber, the writer cannot subscribe to the proposed alternative of surrendering *the entire future* of the production and use of wood into the hands of irresponsible private owners, to act entirely on their own initiative. In this he believes he shares the opinions of foresters in most civilized nations.

18. If the foresters had not chosen to divert attention from fire protection to public purchase of forest lands, we would by this time have undoubtedly

solved the whole question of fire protection.

Reply: For reasons already expressed, we differ flatly with this statement, and claim, instead, that had fire protection been the sole aim of the forestry profession, the progress made would have been measurably slower than it has been.

19. Private owners are crying for a free, equitable business chance to practice forestry, which is denied.

Reply: It is the writer's opinion that instead of land owners crying for an equitable free business chance to "do their stuff", most of the crying has been for fear they would be forced by public regulation to do stuff which they had no intention whatever of doing if it could be avoided. To state or to infer that public competition through production of timber has been or is the reason for failure by private owners to practice forestry is to strain seriously the credulity and exhaust the patience of the reader, and there are few large land owners who would care to substantiate such a claim.

Will the various private and commercial interests and their mouthpieces in this country ever learn that there is room in America for every possible kind of effort in forestry and that it is not necessary to try to destroy one promising line of activity in order to increase the problematical success of another brand of the article? How long will it take some of these spokesmen to grasp the idea that fire protection, insect control, public forests, and private forestry are coördinated parts of a common effort and that when one prospers all prosper, while if one is stunted, the rest are correspondingly dwarfed? That is the outstanding lesson which thirty years has taught the writer. If by reason of these thirty years he now no longer belongs to the younger (and wiser) generation, he can only say: "There, there, children," I'll keep doddering ahead.

A forest supervisor is primarily a business manager in charge of the production of crops of timber and forage on areas averaging 1,000,000 or more acres of government land. He must be able to handle funds and the time of men economically, he must maintain good business relations with large numbers of people and organizations, and he must succeed in keeping the results produced in right relation to the cost of the work. He must maintain discipline which will insure high standards of performance on the part of the men under his direction. He must have an intimate knowledge of his forest and of every line of work conducted thereon.

Forest Rangers' Catechism.

STATE FORESTS AND THE UNEMPLOYMENT PROBLEM

By AUSTIN F. HAWES

State Forester of Connecticut

Connecticut has set an admirable example in giving work to some of its unemployed workers. The author describes how money appropriated to aid the unemployed was spent in giving them work in the state forests and parks. Besides giving the men needed assistance it resulted in improvement work in the woods which would not have been done ordinarily but which will yield handsome returns in greater fire safety and improved growing conditions.

WHEN WILL the present depression end? Will our country profit by its experience and find a remedy for over production and over selling so that such periods will not be repeated? This and similar questions are being asked in every magazine of the day. In our effort to find a remedy without resorting to any form of state socialism so repugnant to American individualism may we not turn back to the land which has been so disregarded in industrial states during the past generation? Every forester has felt pangs in turning down fine upstanding young men who come to him for work, almost without regard to salary, for the sake of getting away from the city. Such cases were weekly occurrences even before the present depression. In Connecticut we have a million and a half acres of forest land mostly owned by people who cannot afford to pay the taxes not to mention improving it. If some readjustment of ownership could be worked out so that the forest growth on this land could be improved through judicious employment of labor, it would go far toward stabilizing employment in the small industrial communities, many of which have been going backward for the past quarter century. The thought naturally comes to one that there would be fewer bandits and racketeers if there were some healthy outlet for this almost universal desire for the outdoor life. While the Legislature seized the opportunity presented by Governor Cross in his inaugural address, and appropriated $100,000 on February 4, 1931 for the relief of the unemployed in improving the state forests and parks, it failed to get the vision of the whole problem of land readjustment. This was shown by the fact that the appropriation for land acquisition was cut in half. This, however, fortunately, may not be serious in the long run. Desirable as it may be to have acquisition proceed evenly, appropriations for acquisition will doubtless come more easily during periods of prosperity; and for development work during periods of depression. Connecticut has already acquired 60,000 acres toward its program of 200,000 acres of state forests. I predict that when this program is accomplished the people will demand more and larger state forests and that their

employment value will be one of the chief reasons for this demand.

The State Board of Control and Finance had allotted $10,000 to the State Park and Forest Commission as an experimental fund for relieving unemployment. Of the total amount of $110,000, the Park and Forest Commission allotted $88,000 to the state forester for work in the state forests, and $22,000 to the state parks.

The use of a large number of men in the state forests created a new problem of organization. Accordingly, small crews of eight or ten men were first organized under the local rangers, and later increased to fifteen or twenty men with a sub-boss to help supervise them. The men were paid forty cents an hour. By the middle of March there were 440 men working in the forests and 110 men in the parks. The latter work was under the Superintendent of State Parks.

Work was conducted in all the eighteen state forests in order to distribute it as widely as possible throughout the state. As agricultural communities were not suffering, most of the men were taken from the small industrial communities which were not as well organized for relief work as the larger cities. Of the 440 men employed in the state forests, 125 were from the large cities such as Hartford, New Haven and Bridgeport, and 315 were from the smaller places like Winsted, Torrington, and Williamantic. When the first plans were made it was thought that considerable money would be required for transporting men to and from work. Such expenditures were entirely eliminated. Men in the smaller communities transported each other. The city governments of such cities as Winsted, Torrington, Middletown and Putnam transported men distances varying from ten to fifteen miles. In return these cities received one-third of all wood cut by these crews, or a total of 1,057 cords. This wood was sawed up by other unemployed men in the city wood yards, and then given to the poor of the cities. Since there are no state forests near New Haven or Bridgeport, camps were established for twenty-five men from each of these cities. These men received thirty cents an hour and board so that the work done by them cost about twenty-five cents a day more than that done by the other men.

All applicants were registered and selected from among those who had the greatest number of dependents. The majority of them were factory hands, but there were also carpenters and painters as well as many common laborers. We were surprised to find how many had had experience in the woods in their early days. It came back to them, and although we did not push them, many developed into good choppers. If a man soldiered on the job or was absolutely incompetent, he was dropped so the morale of the crews was kept far above those of the ordinary municipal crew.

Aside from the object of furnishing employment, the main argument for the appropriation was to safeguard the forests from fire. Accordingly, a system of fire lines was developed so as to cut all forests into blocks of

not over 500 acres. These fire lines, for the most part, followed old woods roads and were cut clear to a width of 15 feet. All dead trees (and there is still a great deal of dead chestnut too small for ties), was removed to a width of 50 feet on each side. Thus a strip 115 feet wide is left free from inflammable material except ground litter. Altogether 335 miles of such fire lines, or approximately 3,000 acres, were cleared of dead trees. Later the center of some of the more important fire lines was harrowed with tractor and harrow. Such a fire line cost something over $100 a mile on the average because of the large number of dead trees to be cut. The most important product from these cuttings was 14,500 chestnut fence posts which are sold to highway contractors.

Next to fire protection, this appropriation made it possible to practice silviculture in our forests on a considerable scale. A number of forest plantations in danger of being suppressed were weeded. Our better stands, accessible to roads, were thinned back for a distance of 200 feet on each side. All trees to be removed were marked by the district forester or other technical foresters who helped out in the project. In this connection, I am glad to acknowledge assistance received from the Connecticut Agricultural College which donated the services of Professor A. E. Moss and Extension Forester Gibbs to take charge of one operation. Mr. Robert M. Ross, Secretary of the Connecticut Forest and Park Association had charge of one operation, and Mr. Wm. Shepard, a consulting forester, was added to the department staff for the emergency.

Thinnings were made in various types and age classes so that many interesting examples of forestry resulted. In a few instances reproduction cuttings were made. Altogether 1,040 acres were treated in one way or another. Since all of this area is accessible to the public its educational value cannot be over emphasized. Large signs are beings posted at the most interesting places. They read: "This area was improved with money appropriated by the state to aid the unemployed, 1931."

To add further to the interest of these tracts, study plots of one acre or less are being established in all types represented. The final crop trees in these plots are banded with a blue ribbon of paint according to a suggestion of Dr. Illick, and will be carefully measured every five years. As the work progressed it was apparent that some men could make more on a contract basis. An arrangement was accordingly made to pay them $2.25 or $2.50 per cord. This, of course, was cheaper than the cutting by the day rate. Altogether $1,836.00 was expended for contract cutting of this kind. In addition to the fence posts cut mostly in connection with the fire lines, 6,255 cords of wood were made and approximately 100,000 board feet of rather small logs. Of course the hauling of the wood and logs out of the woods or yarding on to a road required teams. These were usually hired at $7.00 or $8.00 a day and cost altogether $4,841. As there was consider-

able snow in the winter, this yarding was done with sleds.

One of the best features of the appropriation was the opportunity it gave for trying out trained fire crews. The sum of $1,828 was spent in maintaining such crews at points convenient to a telephone and a truck full of equipment so that they could go immediately to a fire. Nine of these crews stationed at as many forests, attended 124 fires and held the total acreage burned down to 1,502 acres, or an average of 12 acres per fire. They made remarkably good time in reaching the fires, and extinguished 28 fires without outside help. The average distance to a fire was about 12 miles.

With the extra help available for forest planting, it was possible to plant 350,000 trees more than had been contemplated. Altogether 816 acres were planted in the spring of 1931 bringing the total acreage of plantations in the state forests up to 3,280 acres. The following table shows the way in which the appropriation of $88,000 was expended:

Labor and teams	91.3 per cent
Salaries and travel of supervisory force	3.6 per cent
Equipment, tools, food and doctors' bills	5.1 per cent

The indirect results of this work are, in my opinion, more important than those outlined above. In the first place, a considerable number of men were kept employed in healthy outdoor work thereby keeping up their morale and yielding them money for supporting their families. State forests are now known to every one from city mayors and newspaper editors to all classes of laborers, and they are known not only as areas set aside to produce lumber for the next generation, but for their employment value at the present time. Some lessons were learned, and should the experiment be repeated undoubtedly more work can be secured for the same amount of money. One cannot but feel that if a larger portion of our forests were held by owners who could afford to improve them, and do a certain amount every year, there would be a considerable exodus of city-weary people back to the woods and open air. For an industrial state like Connecticut, state forests may come to form the back log for industrial prosperity in the smaller communities. Forest improvement work may be done in periods of depression leaving the crop trees to be harvested when values are high. While labor employed in this way may cost more than regular woods labor per unit of work done, it is infinitely better for the state to spend money in thus building up a valuable resource than in handing out a dole. Our authorities in charge of the relief of the unemployed appreciate this fact. In the thickly populated states the state forests have a value for recreation second only to that of the state parks. This need of the people for open spaces makes it possible to do improvement work which could not be justified from a purely silvicultural standpoint.

FIRE PROTECTION EQUIPMENT ACCOMPLISHMENTS AND NEEDS[1]

By W. B. OSBORNE, JR.

Regional Forest Inspector, Portland, Oregon

In less than twenty years, from nearly a zero start, equipment for fighting forest fires has taken on specialized form but it is still far from satisfactory. The author, a specialist in forest fire control for nearly twenty years, outlines briefly the equipment already developed and points to improvements still needed which should challenge inventive genius. His article suggests the need for a nation-wide inventory of forest fire equipment and a coördination of the regional efforts to improve it.

THE SUBJECT of fire equipment naturally falls under the three heads of prevention, detection, and suppression.

Under prevention equipment, an item of outstanding importance is the new Cyclone Spark Arrester recently developed and already installed on over 300 locomotives by the Northern Pacific Railway Company. Reports from intensive tests and use indicate that it bids fair to eliminate one of our worst causes of fires. When properly installed, the manufacturers state they are prepared to guarantee that the locomotive will be sparkless with any kind of fuel, and at the same time produce steam just as freely.

Other types of spark arresters, outside exhausts, oil-burning equipment, rail sprinklers to avoid brake-shoe fires, and automatic sprinklers around donkey settings, refuse burners, etc., are common equipment widely used for preventing fires. Instrumental equipment such as hygrographs, now widely used in the Pacific Northwest, for detecting unusually critical inflammable forest conditions that demand extraordinary precautions or a general shut-down of logging operations also belong in this list.

Under detection equipment, attention is called to the fact that in the five states of Oregon, Washington, California, Idaho, and Montana, there are now over 1,000 improved and occupied fire lookout stations all provided with telephone connecting them with the rest of the organization. In conjunction with these, a considerable amount of special equipment, in the way of fire-finders, platting equipment, and the like, has been developed for determining the accurate location of fires sighted.

A recent development in the way of automatically graduated panoramic photographs is proving of considerable value in improving initial action and in saving time getting to fires. With these pictures rangers and firemen can determine the precise location of fires in less than a minute and see photographically just where they are located with reference to topography, landmarks, and cover types.

In 1930, the writer had an oppor-

[1]Presented at the Western Forestry and Conservation Association meeting, Spokane, Washington, March 20, 1931.

tunity to test out a set of low-power binoculars fitted with special amber lenses and made up by the Mirakel Optical Company. They helped materially in improving visibility through haze and are probably the only binoculars that will do this.

Airplanes for supplementing the lookouts in special cases and for reconnnoitering fires have been thoroughly tried out and are used as needed in the Pacific Northwest.

One of the outstanding developments in the line of suppression equipment has been the portable gas engine pump. Prior to the advent of this equipment we were unable to utilize, except in a pitifully small way, water, the best material there is for subduing, "mopping up" and extinguishing fire, even though there might be abundant supply close at hand.

The first pumps of this character were developed about ten years ago. The pioneer pumps, as I recall, weighed from 125 pounds to 150 pounds or more. They were too heavy for back-packing, tempermental and balky. They seldom raised water more than 150 feet. In spite of this, they were received literally with open arms and rendered valuable service. In the meantime, manufacturers and fire fighters have been working together for improvements. Present-day fire pumps are proving dependable for long and continuous service. They are light enough for back-packing and are capable of delivering from 35 to 40 gallons of water per minute under high pressure. In fact, the better types are now capable of developing all the pressure that our hose will stand. This means they can deliver large quantities of water through a half-mile or more of hose to elevations of 300 feet or more. It is now common practice to use them in relays for raising water to 500 or 1,000 feet.

The Pacific pumps are now available in four models. The latest model weighs only 36 pounds; type N, 70 pounds; type P, 175 pounds, the capacity varying with their weight. The first two may be classed as back-pack pumps. The larger pump is principally adapted for use around logging camps and on accessible fires. All are compact. They have been popular in the Pacific Northwest region and have an established reputation for service.

The new "Edwards" pump uses a 5-horse power air-cooled motor and has several new and desirable features. Demonstrations and use indicate that it is an excellent performer and well adapted to our work. The large Edwards pump which utilizes a Ford engine as motor power has long been popular for use around logging camps and on accessible fires.

The use of pumps has involved the acquisition of large quantities of hose, various couplings, take-offs, and other accessories, together with provisions for transporting and handling. Most of these items have been taken from the general market just as we found them. Several quick couplings of recent development, especially the Cowan model, are being tried out on a small scale and are well worth consideration.

With the acquisition of large quantities of hose, we soon discovered that in many cases we were able to utilize

gravity systems to excellent advantage by simply tapping streams at a point above the fire, laying in the hose, and where necessary throwing in a dam a few inches high. In mountainous regions we are now applying water by this method almost as extensively as with the pumps.

Large railroad tank cars usually equipped with both steam and gas engine pumps are now common equipment in most logging camps in the Pacific Northwest, and most logging donkeys have some kind of pump and hose. Many protective organizations have automibile trucks provided with large water tanks and pumps for use on fires which may be reached from the roads. A substitute for large tanks which has been tried out with some success is the 55-gallon steel drums with provision for discharge by air pressure.

Unfortunately the major part of our suppression work cannot be accomplished by the use of water simply because the water is not available.

The most outstanding development for speeding up fire line construction has been the introduction of tractor-drawn equipment. Tractors were developed during the World War. Today they are common equipment in a large percentage of our logging camps and on practically all road construction jobs. Frequently in the West they are easier to obtain than horses. Their sturdy construction, power, and ability to operate day and night render them well adapted to fire line construction in the more open types of timber wherever it is possible to get them in and the topography of the country permits their operation.

During the last few years considerable progress has been made in the development or adoption of tractor-drawn equipment for fire line construction. Several types of heavy scrapers, drags, plows, bull-dozers, and ditchers have been tried out. A number of instances can be cited where the heavy "30" and "60" Caterpillar tractors available in logging camps have constructed very effective fire lines by simply hooking onto a large log or boulder and dragging it around the fire. In California the heavy type of tractor has been used extensively with drags or scrapers in the construction of fire breaks. We have recently heard of a one and one-half to two-ton brush cutting attachment for big tractors that has been used in Canada to cut a 9 to 12 foot swath through dense brush and reproduction up to 4 and 5 inches in diameter. For general use, however, a lighter type of tractor such as the 2-ton or No. 15 is preferable in order to permit rapid transportation by truck.

For two-ton and "Fifteen" tractors, the No. 15 "Killifer" ditcher with a few alternations has given excellent results. The alternations consist of substituting a specially-designed plow attached to the frame by a large goose-neck extension so as to gain better clearance. The outfit is mounted on two wheels and provision is made for controlling depth and tripping. It weighs about 850 pounds. Eighteen or twenty are now in use in Oregon and Washington. Most of them have

been used in the western yellow pine and lodge-pole pine types. The Washington Forest Fire Association and the State Forester of Washington have however used them very successfully on cut-over and reproduction areas in the Douglas fir type. In open western yellow pine, this outfit will build an excellent fire line from 50 to 60 inches wide at the rate of from 1.5 to 2.5 miles an hour. The tractor breaks down reproduction 15 to 20 feet high and the plow digs it out and throws it aside. It breaks trees up to 8 to 10 inches in diameter and when tripped can be pulled over larger ones. It has been operated successfully through thick stands of lodgepole pine and white fir, and through manzanita brush 4 and 5 feet high. Fire lines have been built on side slopes of from 40 to 45 per cent and head slopes up to 75 per cent. In short, this outfit builds fire line faster and better than could be accomplished by a crew of 50 men. Quite similar results have been obtained with scrapers which under certain conditions may be preferable to the Killifer plow.

The "Vaughan" tractor, which is a very small unit manufactured for farm use, is a promising piece of equipment that is being tried out on a small scale. It develops 8 horsepower, has caterpillar treads and weighs 920 pounds. For fire line work a special plow is substituted and is attached directly to the frame of the tractor in the usual manner. On test runs in open yellow pine, with loose soil and fairly free from brush, it made from 1 to 1.75 miles of line per hour. It climbed a 47 per cent slope and ploughed around a 45 per cent slope and the width of trail is from 35 to 40 inches. They have been used on several fires to good advantage. On one job one of these tractors built one mile of line in the same time it took a large tractor to build 1.5 miles.

The "Rototiller" is a comparatively new and light motorized unit designed for cultivation that also appears to be adaptable for fire line construction in certain types. A 5-horsepower model weighs 400 pounds and a 7-horsepower model weighs 700 pounds. It has wide tire wheels equipped with grousers.

The unique feature of the Rototiller is that the ground is cultivated or pulverized by means of rapidly revolving spring teeth or knives. For fire line work the pulverized soil which normally remains in place is easily crowded out by the addition of a light scraper. Tests of the smaller unit in the western yellow pine type, with rather hard soil but fairly free from brush, resulted in a good line averaging about 3 feet in width and built at the rate of from 1 to 1.5 miles per hour.

The recent development of a portable "Westinghouse" gas-electric power plant has materially advanced the feasibility of felling snags with dynamite. This plant weighs 118 pounds and can be easily divided into two units for packing. It has a 4-cycle, air-cooled engine and a one kilowatt, direct current generator and is very compact. In a series of tests it gave ample power for operating two one-half inch drills, which together bored one and

one-eighth inch holes in sound snags at a speed of from 40 to 50 inches per minute. This means that snags up to 30 inches in diameter can be bored for loading in less than a minute; 40-inch snags in about 2 minutes. Larger trees are bored with holes about 12 inches apart. There is no question but that with this equipment, snags can be felled in very much less time than with a saw. A North Pacific Coast test on 1400 snags indicated a material saving in costs. While the above plant was designed primarily for use in snag felling, it can also be used for running numerous other electrical appliances or for lighting purposes.

Horse-drawn plows have always been used to some extent for construction of fire lines. Extension of road systems and facilities for transportation of horses and equipment has greatly increased the opportunities for their utilization. They are an important means for speeding up line construction. Many types of plows have been used, but for general requirements, including packing, the No. 155 "Oliver" reversible plow is most popular.

All of the Pacific Northwest fire organizations have various types of fire trucks well designed for transporting men, equipment, and supplies. Heavy trucks suitable for transporting horses and small tractors are rapidly becoming more common.

Several torches for backfiring purposes have been developed and are extremely important items of fire-fighting equipment. The back-pack "Hauck" torch has always been particularly well adapted for this work. Smaller torches are, however, widely used and are giving good results under many conditions.

Back-pack water cans and small hand pumps are very widely used and are excellent for "mopping up," extinguishing "spot" fires, fires in stubs, and the like.

Of the smaller hand tools there have been several designed particularly for our work that are now standard equipment, such as:

The Koch Tool—combination shovel and hazel hoe; the Pulaski Tool—an axe with grubbing blade; the McCloud Tool—rake and hoe blade; the Kortick Tool—rake and hoe blade; Break-down falling saws.

Our cooking and mess equipment has long been pretty well standardized, and is now available in extremely compact and light units.

Improvements Needed

Now in regard to our needs.

In spite of the progress that has been made, I cannot help but feel that our equipment has not been and is not being developed nearly as fast as it should be.

There are several reasons for this:

1. Most organizations are so hard pressed for funds to pay organization and fire-fighting costs that they have very little left for regular equipment and none at all to spend on experiments.

2. Their personnel is so busy in pursuit of its regular work that it cannot give the time or attention that is needed for the further development of new equipment.

3. We are all probably inclined to be too partial to home products and do not give enough attention, study or trial, to equipment that has been or is being developed in other parts of the country.

4. Many organizations are handicapped in stimulating the development of new equipment through their inability to place advance orders or commit themselves to quantity purchases without bids.

5. There is inadequate opportunity for becoming informed as to what is being developed throughout the different forest regions.

The field for development is large and only a few illustrative items can be mentioned.

In regard to hose, I have been informed by a large distributor that over 80 per cent of the one and one-half inch hose in the Pacific Northwest region is sold to forest fire protection organizations and logging camps. In this, just as in many other things, we have been content to buy just what we find in the market, and yet our requirements are entirely different from the conditions under which such hose is ordinarily used and for which it is being manufactured. Frequently our hose lines extend a half-mile to a mile or more. On single large fires we have several miles of hose. It has to be transported into camps with horses and then back-packed to the point of use, frequently over very rough country. In the Pacific Northwest we are using rubber-lined hose which weighs, with couplings, about 38 pounds per hundred feet. This means 2,000 pounds, or 40 back-pack loads per mile. In Canada they are using linen hose of less than half this weight, or about 16 pounds per hundred feet. Each type has its advantages and disadvantages. Cannot we get a hose for our work that will combine the advantages of both and weigh about one-half as much as our present hose? If the weight of hose were reduced one-half, I believe it would nearly double its range of use. Where are we to draw the line between pressure and weight requirements?

In regard to pumps, we feel that great progress has been made in their development by manufacturers who have studied our needs and have tried to meet them. Obviously there is a field for pumps of different sizes and weights, but where is the most serviceable point between pressure and volume?

Tractors and tractor-drawn equipment are just entering the field. Undoubtedly there is a place for large tractors, for small tractors, and for very light tractors. For the great bulk of our work, however, they must be light enough for rapid transportation. Much work needs to be done on the further development of accessory equipment to go with the tractors.

Cannot some very light equipment for use with horses be developed that will give better service than a plow for our conditions? A plow was not designed or intended for use in the woods.

Back-pack water cans are now very extensively used, but why can we not get a back-pack water bag that will

not leak and be just as serviceable? Why must we carry bulky cans that will not collapse and that weigh from six to twelve pounds?

The use of many chemicals has been tried out for our work a number of times and without much success; but when we consider what was done during the World War in the way of gas, it does not seem too visionary to believe that eventually something may be developed that can be used. Any cheap chemical that will materially increase the effectiveness of water hauled by tank cars in effect reduces weight or increases capacity.

With almost any equipment that we use the qualities of light weight, compactness, and dependability, are of outstanding importance.

The protective agencies of the Western Forestry and Conservation Association group alone represent a large purchasing power, and manufacturers are anxious to coöperate and improve their equipment to meet our needs. We should be in a position to tell them of our needs, and also of the market possibilities there might be for fire equipment.

We shall make faster and better progress, however, if we first get together on our ideas of what is needed and then act collectively. A survey of the whole field will enable us to avoid duplication of effort and a waste of time on things which have already been satisfactorily worked out elsewhere, and also to avoid too much diversity and the splitting up of production, which is so discouraging to manufacturers.

To summarize, there is a great need that more study and thought be given to the improvement of existing tools and equipment, to the adaptation to our requirements of equipment now used for other purposes, to the development of new and better types of fire equipment, and even to the invention of entirely new types of fire equipment. All this calls for the best thought of men experienced in the fire-fighting work. Unfortunately, in the past the development of practical fire tools and equipment has been too much a haphazard matter. The field is a large one and the subject most important to all foresters and to all protection agencies, whether federal, state, or private. There should also be a correlation of tool and equipment ideas from all forest regions, in order to avoid duplication, to collect and to correlate new ideas, and to make the existence of new types of fire tools and equipment known to protection agencies of the entire country. Here is a big opportunity, and a big job, in a national coöperative fire effort.

THE UNITED STATES TIMBER CONSERVATION BOARD: ITS ORIGIN AND ORGANIZATION; ITS PURPOSE AND PROGRESS

By FRANKLIN W. REED

Executive Secretary, Society of American Foresters

The Timber Conservation Board, now nearing the close of its first year, is energetically assembling information upon which it will base its recommendations for correcting the evils besetting the forest industries. The considerable number of foresters on the Board's advisory committee is a recognition of the service they might render. At the same time it places upon the forestry profession a heavy share of the responsibility of arriving at workable plans for solving the problems engaging the attention of the Board.

THE UNITED STATES Timber Conservation Board is a temporary body, acting under Presidential sanction, but supported by private funds. The period of its existence is from January 1, 1931 to June 30, 1932. During this year and a half, its task is to assemble and digest available facts and information bearing on the timber supply situation and the condition of the forest industries, to deduce therefrom the causes of the prevailing bad state of affairs, and if possible to prescribe remedies in the form of concerted public and private endeavor.

The forest situation and its needs has long been a matter of public interest and, at times, of acute public concern. It embraces a series of major problems, the solution of any one of which is a step forward in the solution of the forest problem as a whole. One of the most aggravated problems pressing for immediate constructive handling is the almost chronic state of overproduction which has characterized the forest industries for the past decade and a half. It is a situation which has tended to become progressively worse instead of better; has been threatening the forest industries with economic chaos; has been contributing to destructive lumbering and premature and wasteful exploitation of timber reserves needed to meet future requirements; has had a deadening effect upon forest land values and practice of forestry; and has made for insecurity of employment and all of its concomitant evils. A recognition of the seriousness of this state of affairs led, on April 30th, 1930, to a meeting by the President of the United States with a group of prominent citizens representing the forest industries, the forest conservation movement, agriculture, public utilities, and the general public interest. They urged upon President Hoover the creation by him of a U. S. Timber Conservation Board for the purpose of developing sound and workable programs of private and public effort with a view to securing and maintaining an economic balance between the production and consumption of forest products and to formulating and advancing a deliberate plan of forest conservation. The Board, as selected by the Presi-

dent is composed of the following:

Robert P. Lamont, *Chairman*, secretary of the Department of Commerce; Arthur M. Hyde, secretary, Department of Agriculture; Ray Lyman Wilbur, secretary, Department of the Interior; William M. Ritter, representing the hardwood manufacturing interests; John Henry Kirby, representing the softwood lumber manufacturing interests; John W. Blodgett, representing the timberland owning interests; D. C. Everest, representing the pulp and paper industry; Dr. John C. Merriam, president of the Carnegie Institution; Paul G. Redington, president of the Society of American Foresters; Louis J. Taber, Master of the National Grange and representing the agricultural interests; Carl Gray, president of the Union Pacific Railroad; Charles Lathrop Pack, president of the American Tree Association and founder of the Charles Lathrop Pack Forestry Trust; George D. Pratt, president of the American Forestry Association.

This Board, operating under Presidential auspices, is privately financed by contributions, both in money and in services, from the industrial and conservation organizations supporting it. The only cost to the government itself is in the office space loaned by the Department of Commerce and in the contributed time of experts and specialists in the various departments concerned.

The Board held its first meeting early in January of 1931 at which it perfected its organization and appointed an Advisory Committee to aid it in compiling and digesting the vast volume of information and data bearing upon the problem in hand. This Advisory Committee, of which R. Y. Stuart, chief of the U. S. Forest Service, is Chairman, is composed of over twenty members—secretaries of lumber and other forest products associations, professional foresters, operating lumbermen, and other forest products manufacturers, as well as representatives of other interested government bureaus and the Forest Service. It is composed of the following:

R. Y. Stuart, *Chairman*, chief of the U. S. Forest Service; William B. Greeley, former chief of the U. S. Forest Service and now secretary-manager of the West Coast Lumbermen's Association; Dr. Sam T. Dana, director, School of Forestry and Conservation, University of Michigan; Dr. Charles Herty, industrial consultant; Ovid M. Butler, secretary, American Forestry Association; George N. Ostrander, manager, Woodlands Department Finch, Pruyn & Co., Glens Falls, New York; E. T. Allen, secretary-manager, Western Conservation and Forestry Association; Wilson Compton, secretary-manager, National Lumber Manufacturers' Association; John W. Watzek, Jr., member of the firm of Crossett, Watzek, and Gates, owners and lumber manufacturers in the South and West; Tom Gill, forester, Charles Lathrop Pack Forestry Trust, Washington, D. C.; Frederick M. Feiker, director, Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce; George W. Sisson, Jr., president, Racquette River Paper Company, Potsdam, New York; Joseph Hyde Pratt, executive secretary, Southern Forestry Conference, Chapel Hill,

North Carolina; Hugh P. Baker, director, N. Y. State School of Forestry, Syracuse University, Syracuse, New York; Laird Bell, attorney, Chicago, Illinois; J. G. McGowin, prominent southern pine manufacturer and timberland owner; Charles J. Rhoads, commissioner, Office of Indian Affairs, U. S. Department of the Interior; David T. Mason, consulting forest engineer and secretary-manager, Western Pine Association, Portland, Oregon; C. R. White, pine lumber manufacturer in the South; Axel H. Oxholm, director, National Committee on Wood Utilization, Washington, D. C.; Dr. Fred R. Fairchild, professor of economics, Yale University, and director of the U. S. Forest Taxation Inquiry; Carl F. Speh, secretary-manager, Pine Institute of America, Jacksonville, Florida.

The Advisory Committee met early in February and perfected its program of action. It divided its field of inquiry into seven projects and divided itself into seven sub-committees, each one of which is responsible for the completion of its respective project.

Project 1, 2, and 3 will give a picture of the situation, bringing out wherein and why production is out of balance with consumption; viz.—

Project 1: The economic situation of forests and timber industries, including present and prospective timber supply; and present and prospective timber requirements.

Project 2: Status of privately owned timber, logging, and manufacturing plants and distributing facilities—extent and character of timber ownership, trends in timber values—financial pressure for liquidation, especially in the West—the small mill situation, especially in the South—producing capacities; operating efficiency; conditions of utilization.

Project 3: Publicly owned timber—extent and character of commercial timber under public ownership; policies governing public acquisition of timber and timber lands; and policies governing the sale, cutting, and use of publicly owned timber.

Projects 4, 5, and 6 will point out wherein and how the lack of balance may be corrected by: (1) better organization of production facilities; (2) measures to extend consumption efficiency; (3) remedial legislation; viz.—

Project 4: The economy, stabilization and diversification possible through centralized operations—in timber ownership and production—in assembly and distribution of forest products.

Project 5: Distribution and marketing methods; possibilities of diversification and expansion of markets and uses; and promulgation of standards for forest products, and/or methods of enforcement.

Project 6: Federal and state laws and policies in relation to timber conservation and recommendations concerning possible advantageous revision of present legislation, both taxation and others.

Project 7: First, will summarize the Board's findings and set forth plans for putting its recommendations into effect; second, will consider the principles and possibilities of sustained yield forest management as a whole, bringing together under one head all

the ingredients and weaving them into a definite, comprehensive plan of action; and third, will give the final summary of the Board's findings of facts, conclusions, and recommendations for action.

The seven sub-committees, here outlined, have been active in the prosecution of their respective undertakings and progress with all of them is such as to give promise of early completion. Project 1, largely in the hands of the U. S. Forest Service, will be finished, according to all present indications, before the close of 1931. A preliminary report of Project 3 has already been completed and is in the hands of the secretary of the Board. For Project 6, the report of the chairman on Forest Taxation is in the hands of the Board's secretary.

The Timber Conservation Board, as prescribed by President Hoover, has three preliminary functions: 1. To assemble the facts and to deduce its conclusions therefrom; 2. To report its findings; 3. To adjourn. The final date for adjournment is definitely set at June 30th, 1932. The current rate of progress gives assurance that compilation and digestion of the necessary facts will be completed in time to enable the Board to report its findings and adjourn by the date set.

Supplemental to its regular program of action, as outlined above, a Special Committee on Lumber Survey, under appointment from the Board and composed of leading economists and industrialists, is engaged in a study of current relationship between production and market requirements. It has already produced and given public distribution to one report, under date of July 1, 1931, in which it summarizes the state of affairs for the final six months of the current calendar year and reaches the conclusion that the production of lumber during that period, in order to wipe out existing excessive inventories and keep within consumption requirements, should be reduced to about one-third of what has ordinarily been accepted as normal rate of production. A second report of this Special Committee will be forthcoming shortly, after the middle of October.

In closing, the point should be emphasized that in actual cash expenditures the U. S. Timber Conservation Board is costing the federal government absolutely nothing. Financial support is furnished by the American Tree Association and similar conservation organizations, by the National Lumber Manufacturers' Association, American Paper and Pulp Association and by certain of the Foundations. The total cost to the private contributors, bids fair in the end to fall considerably short of the $40,000 originally estimated as the minimum.

The gratifying and whole-hearted coöperation and support from the several trade and conservation associations, and educational institutions, in the way of contributed time of their experts, has made this possible. In accomplishing this, especial credit is due to every member of the Advisory Committee, as well as the Board itself, and to the trade associations, institutions of learning, and professional organizations which they represent.

BRIEFER ARTICLES AND NOTES

Advisory Council Urges Department of Agriculture to Encourage Use of Wood[1]

At the annual meeting of the Forest Research Council of the Pacific Northwest, the following resolution was passed and subsequently sent to the Secretary of the U. S. Department of Agriculture, along with other resolutions passed by that body:

Research and Education to Encourage the Use of Wood:

Whereas, The work of the Pacific Northwest Forest Experiment Station is of great value and should be enlarged and carried on, and

Whereas, Among the objectives of the work done and projected is the ultimate purpose of protecting and improving stumpage values through protection, propagation, and proper utilization of timber and timberland, and

Whereas, The public generally does not for various reasons have a true conception of the quantity and availability of the present supply of timber and its products and great harm is done the Government and other owners of timber on this account, we

Therefore, Request the Forest Service and the Department of Agriculture to make a special effort to inform the public of the present surplus of timber products and the necessity of prompt use thereof to the end that the existent value of all forests both to the owners and to the public be not endangered through a refusal of the public to buy on account of the fear of a timber famine or the impossibility of securing replacements.

Secretary of Agriculture Hyde in writing to Mr. Aubrey Watzek, chairman of the Council, made the following comment on this resolution:

"We recognize the situation in the Pacific Northwest and the factors which make it appear that there is a surplus of timber. At the same time we have to realize that in other parts of the country formerly heavily timbered, the present cut meets only in a small degree local requirements. The history of these other regions may repeat itself in the Pacific Northwest, unless provision is made for assuring permanent supplies.

"We have long needed an authoritative understanding of forest resources, by such means as are now exemplified in the nation-wide Forest Survey. The complexities of the situation in the Douglas fir region were one of the

[1]Through the courtesy of Mr. T. T. Munger, Director of the Pacific Northwest Forest Experiment Station, and of Mr. Aubrey R. Watzek, the editor is able to make available to readers of the Journal an exchange of letters bearing on a somewhat controversial matter. It is of such a character as to make it of interest to foresters and lumbermen alike. *Ed.*

reasons for selecting that area for intensive work by the Survey. The information as to the inventory of timber resources and its relation to cut, etc., should be available for publication within two or three years. This will be helpful to the public, the industries, and to others in a correct understanding of the situation. The only way to assure the public that there will never be a timber shortage is for the forest industries to organize themselves on a sustained-yield basis. This applies to the Pacific Northwest as well as to other regions.

"Among the effective ways to encourage the use of wood is to show how it can be employed most economically and with the greatest degree of satisfaction. The Forest Service has for many years been encouraging the use of wood in different ways, particularly through the work of the Forest Products Laboratory."

Wishing to explain more fully the position of the forestry and lumber interests if the Northwest as represented by the Council, Mr. Watzek wrote a further appeal for help by the department in bringing to the public a true picture of the timber supply situation and the need for increasing the use of wood if the present forests were to be economically utilized and encouragement given to growing future forests:

"In your reply you compared the situation in the Pacific Northwest, where there is a surplus of timber, to that in other sections of the country which were formerly heavily timbered and where now the present cut meets only a part of the local requirements. It is, of course, true that in certain sections of the country which were formerly supplied from local sources it has been necessary to ship in lumber from distant producing districts at a rather high freight cost. However, the nation as a whole has abundant timber resources and reproduction is advancing at a very rapid rate in many of the sections where much of the virgin timber has been cut. This is true in certain sections of the Lake States and more particularly in the southern states where small mill production from second-growth timber has been a big factor for several years.

"It is the feeling of the members of the Council that it is highly important that the consuming public, which in past years has been persuaded by conservation enthusiasts that there is danger of a timber famine or that one already actually exists, be now correctly informed of the true situation so that it may make free and generous use of the timber products of our forests. The per capita consumption of lumber has been steadily decreasing. This decrease is due in part to the unavoidable encroachments of substitutes, but there is no doubt that it is also due in part to a desire to conserve the nation's timber resources for future generations. The manufacturers of substitutes have in their advertising taken full advantage of more or less official pronouncements on our dwindling timber supply which is an indication of their opinion of the value of that type of propaganda to build up sales of substitutes at the expense of lumber.

"The situation in the lumber industry today is so critical, both from the point of view of the private owner and also of the Government as an owner of large stands of timber, that the private manufacturers and the Forest Service must unite in stimulating demand for lumber so that there will be a sufficient increase in consumption to return to the owner of private or public timber the true value of his stumpage. If this is not done, stumpage which is now mature and must be marketed because owners can no longer continue the burden of carrying it, will be wasted; the cream only will be taken, and as a result of this lack of complete utilization, a great national resource will be consumed without adequate return to its owners and without the great possible benefits to the public through large payrolls and the making available for general use in abundant quantities a cheap and admirable building material.

"The Council hopes that with this further explanation of the action taken at its annual meeting, you will be able to share its views on this question which it considers so vital in securing a proper realization of the true value of the nation's timber resources."

To sum up the position of the Department of Agriculture in this matter, Acting Secretary Dunlap wrote Mr. Watzek as follows:

"The Department of Agriculture and the Forest Service have always consistently sought and are now seeking to develop, not to curtail the use of wood. In major part the research work conducted by this department at the Forest Products Laboratory has for its purpose to find out new uses for wood or ways to make wood serve its old purposes better. The country needs not to learn to do without wood but to learn what to do with wood, to use it unhesitatingly and confidently whenever its use is advantageous, and to learn to grow it in amount equal to the need for it.

"In discussing the forest situation this department runs the risk of two misinterpretations: The first is the one that you indicate and to which reference has already been made, namely, that the desirable thing is for the consuming public as a conservation measure to refrain from the use of lumber and other forest products. The second misinterpretation is that the situation as to assurance of ample supplies to meet all future needs is satisfactory. The best available information does not justify either of these interpretations.

"The forestry work of this department is motivated by the desire to promote the practice of forestry as a form of permanent land use and as a means of providing for future needs. The present superabundance of stumpage on the market in the Pacific Northwest should not be permitted to obscure the fact that our future national needs can not be met without a much greater degree of timber growing practice than is now in evidence.

"We recognize that a distressed lumber industry is in poor position to take up timber growing, and we recognize also that a demoralized industry is a bad thing for the public as well as a misfortune for those engaged in it. As already indicated, unduly low

prices for lumber and other forest products tend to discourage the practice of forestry everywhere. We are glad the industry recognizes, as one of the essentials, that forest products must be put on the same modern basis as other materials throughout the broad competitive field. In this observation we include processes of distribution as well as of manufacture.

"We want to assure you again of our appreciation and sincere sympathy for the difficulties in which the lumber industry in the Northwest and elsewhere finds itself. This department is striving to contribute to the solution of the current problems as a needed step in the development of productive economic management of the Nation's forest lands and in assuring permanent forest supplies and benefits."

New Wisconsin Legislation Requires Slash Disposal

Chapter 128, Laws of 1931, of Wisconsin, consists of two sections to cover two distinct phases of the slash disposal problem. One section requires the burning of all material resulting from clearing or brushing operations on the rights-of-way of any public highway or any public utility. The larger problem of disposing of slash resulting from timber cutting operations is met by requiring the clearing of strips of varying width. It was realized that complete disposal of slash would place an excessive burden on all logging operations, and therefore the system of clearing strips to break up large areas of slash was adopted.

The law requires the disposal of all slash up to four inches in diameter within 50 feet of the edge of the right-of-way of any public highway or common carrier railroad. Where needed to break up large areas of slash into tracts not exceeding 640 acres, the slash must be disposed of for a width of 50 feet on each side of any logging road, logging spur, portage trail, or other line. Slash disposal for a width of 66 feet from the line of an adjacent owner is also required where the adjoining land bears valuable forest growth. The slash under four inches in diameter must be burned under permit or removed, but the Conservation Commission may authorize lopping and scattering.

In addition to the disposal of slash, all dead snags or stubs more than eight feet high within such strips and for an additional four rods beyond must be felled, but this provision applies only to cut-over areas. Near any schoolhouse or near the buildings of any small community or any settler, all hardwood slash within 20 rods and all conifers slash within 40 rods must be disposed of.

The disposal of slash, whether resulting from logging or from clearing of rights-of-way, is to be done concurrently with the work or within a reasonable period to be determined by the Conservation Commission, but not to exceed one year. On failure of the agencies doing the cutting to dispose of slash according to law, the work may be done by the Conservation Commission and charged back to the parties responsible.

D. H. Kipp,
Wisconsin Conservation Commission.

Applications for Pack Fellowships Due January 1

January 1, 1932, is given as the closing date for receipt of applications for fellowships in forestry offered by the Charles Lathrop Pack Forest Education Board. Six to eight fellowships are available. Awards will be made to men who demonstrate natural powers of intellectual and personal leadership and who intend to make forestry their life work. No restrictions are made as to age, educational status, or practical experience. The amount of fellowship grants depends upon the circumstances of the individual cases and generally range from $500 to $1800. Applications must be made on a prescribed form on or before the above date. Forms may be obtained from the Board, 1214 Sixteenth Street, N. W., Washington, D. C.

Schlich Memorial Fund

After the death in 1925 of Sir William Schlich, late Professor of Forestry at Oxford, it was felt that his numerous friends, as well as many others not personally acquainted with him, would welcome the opportunity of perpetuating his name in view of his great services to the cause of forestry. With the object of raising funds to provide some form of memorial a committee was formed, and up to June, 1928, a total sum of £1,725 was collected, of which £278 was subscribed in the United States of America. After consulting subscribers as to the form of the memorial, the Committee decided that the money collected, less some £24 required to defray the cost of a bronze portrait plaque of Sir William erected in the School of Forestry, Oxford, should be placed in Trust and invested and that the annual interest should be devoted to the payment each year of a personal grant for the furtherance of study or research in forestry, the grant being awarded by the Trustees to different parts of the British Empire and to the United States of America in rotation. The award for 1929 went to Australia, the sum of £75 having been paid to the Australian Forestry School, Canberra, to provide a gold medal to be given annually to the best student of the School. The award went in 1930 to New Zealand and in 1931 to India, but no decision has yet been reached in either case as to the purpose to which it is to be devoted. The Trustees of the Fund have now decided that the award for 1932 is to go to the United States of America. The Trustees are three in number, namely the Chairman and Vice-Chairman of the Empire Forestry Association and the Professor of Forestry, University of Oxford.

"White Pine" Again Denied

In the October 1931 Journal of Forestry was reported the recent order of the Federal Trade Commission to the producers of lumber from *Pinus ponderosa* in the western states to cease and desist from further use of the trade names California White

Pine, Arizona White Pine and similar names when applied to the species in question. Twenty-three companies of Oregon, California, New Mexico, and Arizona immediately petitioned the Commission for a rehearing. On September 28, 1931, the Commission announced to the press that this petition has been denied.

Thus ends the second phase of a celebrated nomenclature case, which doubtless will be carried further. In denying the rehearing the Federal Trade Commission shakes one's faith in its consistency and competence, for in almost the same breath, actually only two months earlier, it dismissed its proceedings in the even more celebrated "Philippine mahogany" case. The latter case was begun in 1925 on complaint of producers of genuine mahogany. The Commission, in July, 1926, ordered the dealers of the Philippine product to discontinue calling it Philippine mahogany, and the Circuit Court of Appeals sustained the Commission, while the U. S. Supreme Court refused to review the case. Then followed a protest of the Philippine hardwood dealers and producers to the Commission against its original findings, and new arguments were introduced. Last July after six years of very costly trials and arguments, the Philippine hardwood dealers won their case. But it was exceedingly good advertising and cheap as such.

It seems that if the Commission wishes to retain the confidence of the public it should, when the "white pine" producers present their case again as did the Philippine producers and dealers, dismiss the complaint against them and permit them to call their wood a white pine, in fact anything they wish, undesirable as either might be. Nor would it be inconsistent with its Philippine mahogany decision to permit the continuance of the name "Oriental walnut" for the wood of *Endiandra palmerstonii* of the family Lauraceae. Western yellow pine (*Pinus ponderosa*) is much more nearly the equal of a true white pine than any one of the several "Philippine mahoganies" is the equal of any species of true mahogany (*Swietenia* spp). At least western yellow pine *is* a pine; *none* of the Philippine woods in question are even closely related to true mahogany botanically, and it takes a mighty stretch of the imagination to see in them the qualities and properties of true mahogany.

The case illustrates the great power of united action and the value of perseverance. The western "white pine" house is one divided against itself; the Philippine mahogany house was drawn into a powerful unity by its nomenclature vicissitudes.

The first "white pine" order has already resulted in the merging of the two western pine manufacturers associations and the adoption of a new trade name, "Ponderosa pine" for the lumber of *Pinus ponderosa.* Entirely aside from the merits of the case in the eyes of the Federal Trade Commission, economists and technologists, there are many producers who believe that a trade name like California "white pine" is really not the business asset it has long been thought to be. Probably the "Philippine mahogany" producers will find the same to be true

in their case when they try to get mahogany prices for their wood. The public has come to the point where a trade name means a disguise or else a sum total of just nothing, and it has learned to inform *itself* rather than be informed by dealers.

Whatever the ultimate outcome of the "white pine" case will be, most of the western producers will hereafter call the wood "Ponderosa pine", a term above any existing laws. Certainly the foresters' name, "western yellow pine" is no more appropriate than the names that have been condemned by the Commission. Long ago the chief forester of the Forest Service practically promised the producers that the government would drop "western yellow pine" as its official name for one like "Ponderosa pine." It would appear therefore that the government should carry out this promise without delay. Until it does the past confusion in the nomenclature of *Pinus ponderosa* will continue.

Emanuel Fritz,
University of California.

Walnut Wood Nomenclature

Manufacturers and producers of walnut woods, who adopted a number of trade practice rules at a conference held in October, 1929, recently accepted several changes in the rules suggested by the Federal Trade Commission. Among such changes was the Commission's declination to approve or accept one Group II rule formerly received and published originally in January, 1930.

The Commission has approved only one rule (Group I) which pertains to false use of the word "walnut." Another rule was accepted by the Commission as an expression of the trade (Group II). It refers to proper descriptions of walnut woods.

Full text of the Commission's statement to the walnut wood trade, and released on September 12, 1931, is as follows:

GROUP I

Rule 1.—The Commission substituted and approved the following for Rule 1, Group I, as published January 27, 1930:

The false use of the term "Walnut", either alone or in conjunction with other words, as applied to wood other than the wood of the tree of the botanical walnut family, or the genus *Juglans*, with the tendency and capacity to deceive or mislead purchasers or prospective purchasers, is an unfair trade practice.

GROUP II

Rule A.—The Commission substituted and accepted the following for Rule 3, Group II, as published January 27, 1930:

The present commercially used species of "Walnut" should be designated with a qualifying adjective indicating the species, variety or place of origin, and the following names shall be the accepted trade names for use in the United States:

Juglans nigra, to be called "American Walnut" or "Black Walnut".

Juglans cinera, to be called "White Walnut" or "Butternut".

Juglans regia, to be called "Royal" or "Persian Walnut".

From England, to be called "English Walnut".

From France, to be called "French Walnut".

From Italy, to be called "Italian Walnut".

From Turkey, to be called "Turkish Walnut".

From Russia, to be called "Russian Walnut", or "Caucasian Walnut" or "Circassian Walnut".

From Spain, to be called "Spanish Walnut".

Juglans sieboldiana, to be called "Japanese Walnut".

Juglans boliviana, to be called "Bolivian Walnut".

By direction of the Commission:

Otis B. Johnson,
Secretary, Federal Trade Commission.

P. S. Attention is called to Federal Trade Commission vs. Raladam Company, decided May 25, 1931, in which the Supreme Court of the United States has apparently held that in order for a practice to constitute an unfair method of competition it must be shown to have the tendency to injuriously affect the business of competitors.

Forestry Appropriations

In view of the budgetary situation which confronts the Federal Government, according to a bulletin of September 25 from the Forester's Office of The American Forestry Association, the Board of Directors of The American Forestry Association at its meeting on September 17 recommended that during the coming session of Congress the policy of the Association in promoting legislation and increased federal appropriations for forestry and conservation conform to the following:

1. Substantial increases will be advocated only where clearly warranted by emergency needs.

2. Promotion of new legislation will be confined to laws needed to meet specific situations of urgency.

3. Opposition of legislation which will adversely affect the interests of forestry and conservation.

The bulletin further states that, during a recent conference with Colonel J. Clawson Roop, Director of the Bureau of the Budget, the Association's Forester stressed the need for continued increases with which to safeguard the nation's forest resources against fire. Moderate increases were urged for fire prevention and protection on the national forests. The need for more roads, trails and telephone lines in order to make the forests more accessible to fire fighters was emphasized. Accordingly, he urged material increases to the present appropriations of $1,775,000 for coöperative fire protection under the Clarke-McNary Act, and to the relatively small amounts available for the protection of national forests, Indian forests and forests on the Public Domain.

"The Director's attention was called to the increasing menace from blister rust in the white pine stands of northern Idaho and western Montana. The disease threatens the existence of commercial white pine stands covering over three million acres and valued at $90,000,000. During the past year the Bureau of Plant Industry declared that control measures must be completed within ten years if the white pine of that region is to be saved. To accomplish this, the Bureau's program calls for doubling the present appro-

priation of $195,000 for control work on national forests and for adding $75,000 for coöperative control work on state and privately owned land and for research in control methods.

"Federal responsibility for adequately safeguarding the health of more than thirty million tourists and recreationists who annually visit the national forests was pictured. The present appropriation of $67,000 to furnish sanitation on the several campgrounds is inadequate and should be increased by at least $100,000. . . . .

"Although non-communicative Colonel Roop appeared more receptive to arguments for increased appropriations for protecting forest areas than for any appropriations which would increase forest purchases under the Weeks Act. . . . . There is no likelihood that the present two million dollar appropriation for forest acquisition will be recommended for an increase.

"The Forester called attention to the need of more liberal support for the Timber Resources Survey if its results are to be useful within a reasonable period. He also referred to the studies under way by several forest experiment stations to determine effective ways of protecting against erosion.

"The Seventy-Second Congress will convene on December 7 and as usual one of the first responsibilities will be to consider and pass the several appropriation bills. The budget is now being prepared, but will not be available until Congress is in session. Public hearings before the appropriation committees will probably begin in December."

States Allotted Funds from National Forest Receipts

Federal funds amounting to $1,240,608.99 will be made available to 32 states and territories from the receipts of the national forests for the fiscal year 1931. The apportionment of 25 per cent of the net receipts, as required by law, was announced by the U. S. Forest Service, on October 12.

The payments received by the states will be turned over to the counties containing national forest lands, to be used for roads and schools. The funds are allotted in proportion to the receipts realized from the national forests within each state, and represent a federal payment in lieu of taxes on the national forest land.

On account of a decrease in the returns from national forest timber sales, this year's payments to the states show a decline from 1930. Net receipts of the national forests for the fiscal year ending June 30, 1931, amounted to a little less than $5,000,000 as compared with $6,751,500 for the preceding fiscal year.

Besides the direct payment of 25 per cent of the receipts to the states, 10 per cent of the receipts, amounting to $496,243.59, will become available for expenditure by the Forest Service for national forest roads and trails. This is in addition to the regular appropriations by Congress for road and trail construction, which last year amounted to more than $16,000,000.

Louisiana and Wisconsin, as the result of recent acquisition of national forest land within their boundaries, this year will share for the first time in the allotment of funds from the national forest receipts. Arizona also will receive $30,358.89 and New Mexico $525.25 for school funds under the acts of June 20, 1910. The accompanying tabulation lists the apportionments by states.

Distribution among the states containing national forests of the 25 per cent of receipts, and apportionment of the 10 per cent fund, according to records compiled by the Forest Service, follow:

State	25% Fund	10% Fund
Alabama	136.38	54.55
Alaska	12,931.37	5,172.55
Arizona	68,919.57	27,567.83
Arkansas	20,035.70	8,014.28
California	280,824.46	112,329.78
Colorado	135,212.00	54,084.80
Florida	10,059.76	4,023.90
Georgia	2,170.21	868.09
Idaho	133,081.12	53,232.45
Louisiana	1.63	.65
Maine	803.59	321.44
Michigan	982.66	393.06
Minnesota	8,883.64	3,553.45
Montana	67,151.98	26,860.79
Nebraska	2,106.12	842.45
Nevada	25,930.69	10,372.28
New Hampshire	11,578.46	4,631.38
New Mexico	32,211.46	12,884.58
North Carolina	4,753.91	1,901.57
Oklahoma	1,514.78	605.91
Oregon	122,557.51	49,023.00
Pennsylvania	3,334.38	1,333.75
Porto Rico	63.75	25.50
South Carolina	635.97	254.39
South Dakota	32,099.22	12,839.69
Tennessee	3,015.35	1,206.14
Utah	58,054.73	23,221.89
Virginia	5,853.76	2,341.50
Washington	115,174.01	46,069.60
West Virginia	473.82	189.53
Wisconsin	1.56	.63
Wyoming	80,055.44	32,022.18
Total	$1,240,608.99	$496,243.59

New York Reforestation Program Progress

With reports arriving from District Foresters showing the virtual completion of fall plantings on 5,000 acres of State reforestation areas, Conservation Commissioner Henry Morgenthau, Jr., reports that the practicability of carrying out the reforestation program embodied in Amendment No. 3 to the state constitution, which is to come before the voters of the state for ratification November 3, had been fully demonstrated.

"In this, the second year of the enlarged reforestation program", said Commissioner Morgenthau, "the crews working under the direction of William G. Howard, superintendent of the division of lands and forests, have completed reforestation of 28,000 acres of land, while the quota set for this year was only 15,000 acres. They have made up a deficiency of 5,000 acres from last year, caused by delays in clearing titles, and have added another 8,000 acres beyond the combined quotas for the two years. In doing this they have not only established a pace for the work which puts them a year ahead of schedule, but they have established the fact that it will be a relatively simple matter to expand nursery and planting facilities at the rate required by the program, which rises at the rate of 10,000 acres a year to 100,000 acres in 1940.

"Obviously, to reach this rate, we shall have to increase our nursery operations by steady progression so as to have enough trees of the right age

to plant each year. The necessity of planning the work and starting operations at least five years ahead of field planting is one of the chief reasons why the amendment, setting up a long-time schedule, is of such great importance."

The amendment sets up an eleven-year schedule of appropriations, beginning with $1,000,000 for 1932 and increasing $200,000 annually until a maximum of $2,000,000 is reached in 1937, to be continued for six years. The entire program calls for the reforestation of one million acres of idle land, abandoned for farming purposes, of which it is estimated there are nearly 4,000,000 acres in the state.

This fall's planting operations have proceeded at an unusually rapid rate, as it was desired to take full advantage of the rains that ordinarily precede the winter freeze-up. In the week ending October 3, 2,097,981 trees were planted on six areas in Schoharie, Chenango, Cortland, Onondaga, Allegany and Chautauqua counties.

The remarkable progress made in the reforestation work this year is in part accounted for by the unemployment situation and the desire of the department to give work to as many men as possible. Complete figures on the year's work show that 30,000 days of work were given out in the planting operations alone, exclusive of the work on fire lines and blister rust protection in and around the reforestation areas.

This year's plantings totalled 20,379,011 trees. Altogether, since a beginning was made on the reforestation program in 1929, 27,397,092 trees have been planted on 33,440 acres of land acquired for reforestation.

New York's Blister Rust Control Work Breaks Record

All records for white pine blister rust control work in the state have been broken by operations carried on under his direction this year, reports received by Henry L. McIntyre, supervisor of forest pest control in the New York Conservation Department show.

The number of acres of white pine forest and plantations protected by the year's eradication work is 132,000, Mr. McIntyre announced. The previous high mark was reached in 1929, when 127,000 acres were covered. Last year's work accounted for 107,283 acres.

The measure taken for the protection of white pine trees from the blister rust is the removal of plants of the Ribes genus from the surrounding areas.

A considerable part of this year's blister rust work was in protecting the new state reforestation areas. Of these 17,135 acres were protected by the year's work, in the course of which 420,975 bushes of Ribes were destroyed. Besides removal of all these plants from the areas themselves a protective border was established 900 feet wide in open country and 400 feet wide in woodlands adjacent to the planted areas. The cost averaged 47 cents an acre for the area protected.

New Course in Forestry

A new course in camp leadership has been organized and added to the curriculum of the New York State College of Forestry at Syracuse, N. Y. by Dean Hugh P. Baker.

Fay Welch, special lecturer in camping technique will give the course in the new Department of Forest Recreation and Park Engineering. This Department supersedes the two Departments of Forest Recreation and Landscape Engineering, formerly established at the College. The course is open to students of the University and any adult interested in this line of study. Requests for further information should be directed to the Department.

Mr. Welch has specialized in camping and camp leadership extensively, having served on the staff of the camp leadership course of Teachers College, Columbia University, for eight years. He has given other training courses for the Camp Directors Association, Girl Scouts, Woodcraft League, Camp Fire Girls and similar organizations.

Northern Rocky Mountain Forest and Range Experiment Station Enlarged

The consolidation of all research work for the northern region of the U. S. Forest Service in the Northern Rocky Mountain Forest and Range Experiment Station near Missoula, Montana, was announced October 14.

This consolidation will make no radical changes in personnel of those investigative units which have been functioning. Lyle Watts has been appointed Director of the Station. R. H. Weidman will continue in charge of all forest management studies. M. I. Bradner, in addition to handling the investigative work in forest products, will take charge of the work in the region for the newly launched Forest Survey.

Additional work following the consolidation will include, according to the Forest Service, expansion of the much needed investigations into forest fire protection problems, and research pertaining to methods of utilizing forest ranges and handling livestock. This latter work will, however, be confined, for the present at least, to such projects as can be handled in coöperation with the Bureau of Animal Industry at the U. S. Range Livestock Experiment Station at Miles City, Mont. The consolidation will permit greater efficiency and coördination of forest and range research in the region.

Idaho School of Forestry Honored

In the October, 1931, Journal of Forestry, on page 964, mention was made of the election of Duke Forest to membership in the International Union of Forest Research Organizations. Word has been received that an additional American school has been so honored, this time the School of Forestry at the University of Idaho. The total number of American forest institutions honored by this organization now totals eight.

Progressive Legislation Stabilizing European Forest Industries

"Communists, socialists, liberals, ultra-conservatives—in fact, all political factions—are coöperating with forest owners in Sweden in formulating the most progressive and farsighted forestry legislation in force in any country", according to Axel H. Oxholm, director of the National Committee on Wood Utilization of the Department of Commerce, who returned recently from a three-months trip to Europe, where he investigated European forests and forest industries.

"As a result of this unity of action, the Swedish forests, which are the backbone of that country, are in a better condition at present than at any time in the country's history. Other countries in Europe are now following the Swedish example in order to safeguard this important national resource. Regulation of timber cutting and timber growing is recognized in Europe today as the most powerful medium of stabilizing European forest industries".

"One would believe", Mr. Oxholm said, "that the European forests would gradually be cut out. Such is not the case, however, since most of the important wood-producing countries already have taken steps to balance cut and growth". "All these activities", he stated, "are supported by a keen appreciation on the part of the public in regard to the value of the forests and the necessity for their maintenance. Forest fires are under control in Europe, with the result that the damage is slight from this source".

Mr. Oxholm made a special study of European lumber marketing practices, and will report his findings to the United States Timber Conservation Board, as a member of its Advisory Committee.

The Amercian forest industries have excelled those in all countries in educating consumers, and in his report to the Department of Commerce on European markets for American lumber he will emphasize the need of extending this educational campaign to European consumers of American wood products.

"In proportion to its real worth, American lumber today is probably sold at lower prices than lumber from any other country", he said. "We have quality products, and apparently do not know it".

The "New Competition" in Woods Personnel

Paul Hosmer in his intensely humorous book *Now We're Loggin'*, has this to say anent the entry of forest school graduates into the employ of lumber companies:

"The veteran lumberjack, famed in verse and story as the original American he-man and a ten minute egg anyway you want to take him, accustomed and trained to hard, dangerous work and hard, dangerous liquor, is still in our midst to some extent, but each year the type decreases. He is losing his identity in the coming generation of young, aggressive and up-to-

date youngsters who are migrating in increasing numbers to the western lumber centers from the forestry schools and logging colleges. These young men are gradually usurping the old-timer's place; they study his methods, improve on them, suggest this, that and the other thing, and throw monkey wrenches into the machinery in general. The new type of lumberjack, fresh from a forestry school, may be inclined, perhaps, to over-reach himself on sundry things and subjects, but at the same time he is earnestly interested in learning the lumber business from the ground up and isn't a bit afraid of giving an honest day's work for value received. Numbers of other young men of the new generation are coming into the camps, armed for the most part with a good high school education, and are taking an active interest in the study of modern logging methods." . . . .

. . . . "Our colorful friend with the clothes, whom we were discussing a moment ago, is not the woods expert he looks to be, disappointing as it may seem. Nine times out of ten he is a forestry school student absorbing his woods education from a book in the winter and getting a little practical experience in the summer. The tenth time he is liable to be a relative of the second vice-president of the company, in which case he learns all there is to know about logging in ten days and is called back to the head office to go out on the road before the donkey puncher can hit him with a line.

"The forestry student has been reading something by Stewart Edward White which has inflamed his imagination to the point where he buys his wearing apparel in a sporting goods store, and at the end of three months of hard work in the woods is usually willing to admit that he is ready to break away from day labor and take a job as superintendent of a large mill in the south next summer. He will, on no provocation whatever, explain fully the difference between the texture of Sitka spruce and Siberian hardwood, and is want to converse learnedly and at length on the relative market value of white pine as compared to Yucatan mahogany. All this, you will readily see, is of intense interest to the old-time lumberjack who has only seen one piece of real mahogany in his life and that was a hotel bedstead made of good old Vermont apple trees. He sometimes wonders why it is that the modern forestry school doesn't specialize a little more in crosscut saw filing, and he has been known to make an absurd statement to the effect that while a personal and intimate knowledge of the habits, home life and method of reproduction of the pine beetle is doubtless of extreme importance to the lumberjack, at the same time there is a certain knack in knowing how to set a choker and get out of the way before the line is tightened that should be gone into a little more thoroughly in the logging colleges. There is also some doubt in the old-timer's mind as to just how far the study of cypress logging in the Florida everglades is going to take the scholar who expects to spend his life logging Oregon pine, but this is, of course, unimportant.

"The only time the student is squelched to any noticeable extent is

during the stove logging contests at night. During these sessions he finds himself a little out of his depth. When the day's work is over the old-timer likes to take his ease on his bunk and his mind reverts to the old days when logging was done with a cant-hook and a team of 1800-pound grays. He likes to tell of the years when he went into the woods in October with his blankets on his back, lived on beans and salt pork for seven months, worked in snow up to his suspender buttons twelve hours a day with the mercury at thirty below; slept in a bunkhouse with thirty-two men and sixty-four socks; lived in ice water from the waist down from March to May each spring when the snow melted and the drive came down the river, and the season wound up in a blaze of glory with a grand and glorious drunk in which the winter's wages were shot in one night. The student doesn't believe all this, but he is placed in a very embarrassing position in that he can't prove it is untrue, and is forced to sit around and do the listening until such time as the conversation swings around and touches on something he has studied in school. Then he horns in with a great enthusiasm and gusto and will debate at length on the relative values of the different makes of fire fighting equipment, explains minutely the best way of handling fires, and airs his views as to what the company ought to do about it." . . . .

. . . . "As I say, in spite of certain shortcomings which appear on the surface when the student logger is first turned loose on an unsuspecting world, there is something about the new generation which inspires confidence. These boys are future lumbermen and the old-timer is losing caste. The downfall of the old-timer, I maintain, dates from the invention of the brass bar rail." . . . .

Biological Abstracts

The officers of the Union of American Biological Societies are attempting to secure a maximum number of new subscriptions for *Biological Abstracts* before January 1, 1932, in order that abstracts already in hand may be published more promptly and indices brought up to date. Under existing arrangements the costs of printing are paid from subscriptions while editorial costs are paid from subsidy. Since additional funds are needed for editorial work we are also seeking to increase the current subsidy. These two undertakings are intimately related. A growing subscription list will be of great assistance in our efforts to increase the editorial support. An adequate subsidy should make the *Abstracts* as compelling for the biologist as *Chemical Abstracts* has become for the chemist and thus bring new subscribers.

As an inducement to subscription, the Union offers a limited number of back files at greatly reduced prices. This is an unusual opportunity for new subscribers, individuals, and forest schools and experiment stations whose files are incomplete. *Biological Abstracts* is of great value to the advancement of research in forestry. The editor of the Journal of Forestry urges the consideration of the Union's offer.

REVIEWS

Edited by Dr. Henry Schmitz, University of Minnesota, St. Paul, Minn.

Resources and Tax Base of the Forest Counties of Minnesota. By Fred Rogers Fairchild. *Progress Report of Sept. 5, 1928. Forest Taxation Inquiry, U. S. Forest Service, New Haven, Connecticut.*

The Forest Counties of Minnesota: Tax Base Continued, Tax Rates, and Tax Burden on Wild Lands. By H. H. Chapman. *Progress Report No. 5, Forest Taxation Inquiry, U. S. Forest Service, New Haven, Connecticut. Nov. 1, 1929.*

Property Taxation in Selected Towns in the Forest Land Regions of Minnesota. By R. C. Hall and P. A. Herbert. *Progress Report No. 9, Forest Taxation Inquiry, U. S. Forest Service, New Haven, Connecticut. July 1, 1930.*

These three reports deal with the taxation situation in the formerly forested, now largely cut-over, but as yet agriculturally undeveloped region of northeastern Minnesota. They summarize the great mass of information which the Forest Taxation Inquiry has secured concerning the region dealt with.

More specifically the Progress Report of Sept. 5, 1928 summarizes by counties a large mass of data concerning the present resources of the sixteen forest counties of the state. It consists of 22 tables, 3 figures and 12 pages of discussion, covering, for these counties, the area, population, industries, land and timber ownership, present and prospective land utilization, and the total amount of the tax base together with its distribution by property classes between the cities and villages on the one hand and the rural townships on the other. The information contained in these tables and figures and in the discussion which precedes them, is basic to an intelligent consideration of the Taxation problem presented by the cut-over lands within these counties. A large acreage of these cut-over lands are now tax delinquent. For purposes of comparison, information parallel to that summarized for the forest counties, has also been collected and summarized for a good agricultural county, namely Winona County, located in the southeastern part of the state. In Winona County the farm woodlot covers 32 per cent of the total farm area for the county and should ultimately be of considerable economic importance.

The following items are the highlights in this Report.

The sixteen forest counties here dealt with have a total land area of 19,301,000 acres which is equal to 37 per cent of the total land area of the state. Up to 1925 only 3,540,000 acres (18.3 per cent) of this area had passed into farm ownership. Only 1,050,000 acres (5.4 per cent) of this area had, on that date, been cleared and improved to the point where it was plowable. Perhaps the percentage for the rest of the state, 60.9 per cent, which the area of the plowable lands make up of the total farm area will give one an even better idea of the scantiness of the agricultural development which one finds in these forest counties.

It is estimated that 6,400,000 acres of the 18,251,000 acres not now plowable never will be successfully used by agriculture. Clearing and improving the remaining 11,851,000 acres which might be made plowable is going to go forward very slowly. At most, not more than 2,200,000 acres, and probably much less than this area of newly cleared land will be required for agricultural use by 1950. This leaves about 16,000,000 acres which may be used, until 1950 (and probably much longer) for the production of timber.

What is the present condition of these lands? The greater portion of them have been logged over in the last fifty years. The lumber industry of this state reached its peak about 1899, when it was the third state from the top in volume of forest products manufactured. By 1919 it had dropped to 19th place. By 1927 only half a dozen large operations were still active. In that year the amount of standing timber remaining was estimated at 6,084,000,000 feet, board measure, of sawtimber (70.8 per cent in private ownership, 15.7 per cent in United States ownership, and 13.5 per cent in state ownership) and 7,371,000,000 feet, board measure, of other products (61.8 per cent in private ownership, 18.9 per cent in United States ownership, and 19.3 per cent in state ownership). Compare the present forest situation within this region with O. H. Kelley's idea of its future, as given by him, under *Timber* in the U. S. Dept. Agri. Rpt. of 1863, "Pine stands first, and of this we have enough to supply all the demands that may be made upon the forests for a hundred years."

Of the 19,301,000 acres of land within the sixteen forest counties, 2,174,000 acres (11.3 per cent) is owned by the United States, 1,926,000 acres (10.0 per cent) is owned by the state and 15,095,000 acres (78.7 per cent) by private owners.

Within this region, in St. Louis and Itasca Counties, is one of the world's most important iron ore deposits. These iron ore deposits produce the greater part of the tax revenue of the villages and townships within which they are found.

In the present tax base rural land values are predominant in nine of the sixteen counties and of considerable importance in five of the others. Iron ore is of outstanding importance in two counties, St. Louis and Itasca, and of considerable importance in a third, Crow Wing. Timber is now of real importance as a tax base in only one county, Cook. It is, however, of considerable importance in two others, Lake and Koochiching.

Progress Report No. 5 continues the discussion of the tax base started in the Report of Sept. 5, 1928. It also takes up the tax rates and the tax burden applying to wild lands within the sixteen forest counties. Parallel data for Winona County, located in the southeastern corner of the state is included in order to provide a background for comparison.

This Report consists of 14 tables, 4 figures and 12 pages of discussion. Among other things this Report shows that, while the total assessed values for these counties have grown enormously since 1880, the per capita assessed value has remained almost stationary. But while per capita assessed values have remained nearly stationary for 45 years, there has been large and an almost continuous increase in tax rates during this period. With the exception of city and village property in St. Louis County, the tax rates throughout this region, both for urban and rural property are high. Outside of St. Louis County the city and village rates average 109 mills and the country rate 89 mills. The corresponding rates for the rest of the state are 73 and 36 mills. By law, in Minnesota, land and buildings are assessed at 40 per cent of their estimated true value if located within cities or villages, and at 33 1/3 per cent of such value if located in the country.

In the sixteen forest counties the area of wild lands very greatly exceeds that of farm lands. Taxation records, however, are not kept in such a way that one can determine exactly the tax burden resting on the wild lands as compared with that resting on farm lands. A formula has been devised and is included in this Report for approximating the relative tax burdens carried by these different classes of property. Calculations based upon this formula indicate that throughout this region "wild" lands are assessed at as high a value, or at nearly as high a value as "farm" lands.

Special attention is given to St. Louis County because it is outstanding both in area and, in assessed value. In this county iron ore is found in rural townships whose area covers only 15 per cent of the total rural area of the county. Yet the assessed value of these iron ore townships amount to 86 per cent of the total assessed value of all rural property in the county. The tax rates for the iron townships average 59 mills while the rates for the non-iron townships range from 72 to 110 mills and usually are highest in townships where agriculture has reached relatively its best development. But high tax rates do not necessarily mean a high tax burden. A high tax rate may be offset by a low assessed valuation. In one large school district, with a tax rate of 110 mills, wild land, because of its low assessed valuation, is paying a tax of only six cents per acre. In this county the school tax varies from a minimum of $39.00 per pupil, for one of the best agricultural districts to a maximum of $169.00 per pupil in one of the iron townships. In general the school tax, per pupil, is lowest for the better agricultural areas and highest for the most poorly developed agricultural areas and for the iron townships.

Progress Report No. 9, which is the

third of this series, presents in detail the economic and physical data pertinent to taxation for 17 rural towns in the forest counties and for 4 rural towns in Winona County. These townships are believed, by the authors of this Report to be typical respectively of the cut-over region of northeastern Minnesota and of agricultural southeastern Minnesota.

Every parcel of property (land, buildings and timber) found within each of these townships was appraised. A field survey of each of these townships was made in order to make this appraisal. During the progress of the appraisal each parcel of property was thrown into its proper class. Then, for each township, the appraised value for each class of property was compared with the assessed value of that class. This investigation showed that the various classes of wild lands were almost universally assessed at a much higher value than at what they were appraised, while operated farms were assessed at a somewhat lower value than they were appraised at. Often wild land was found to be assessed at as high a rate per acre as was the average acre in operated farms where on the average, about one-fifth of the total area of the farm was improved. Thus was an attempt being made by the local populations to force wild lands, usually absentee owned, to pay an excessively large part of the taxes collected in each of the forest townships. After this comparison had been completed the tax delinquency situation within each of these townships was studied. At the time this study was made (1927), tax delinquency had already become a serious local problem in several of the townships examined.

A description of the methods followed in making the appraisals is included in this Report.

To the reviewer it seems that part of the data here tabulated could have been more advantageously entered on maps. If it had been so entered, these same areas could be re-studied more intelligently in the future.

Altogether these three reports are a very valuable contribution to our knowledge of the specific wherefores of forest land tax delinquency. The last of these reports illustrates the practical working out, in the cut over townships, of Henry George's theory of taxation, although his theory has probably never been heard of by any of the residents of these townships.

J. H. Allison,
University of Minnesota.

Metsatyypin vaikutuksesta puun painoon. (On Influence of Forest Type on Weight of Wood.) By I. Lassila. *Acta Forestalia Fennica. Vol. 36: 1-125. 1930.* (*English Summary.*)

After reviewing investigations of the influence of soil quality on the weight of wood, the author states that the lack of results comparable with each other in this field of investigation, as well as in wood technological research in general, is in the main due to the fact that research concerning the weight of wood, has not been based on forest

types. This paper supplements a previous study of investigations of the weight of whole pine stems from Myrtillus and Calluna types by further investigations of trees from Calluna, Vaccinium, and Oxalis-Myrtillus types.

Tests of 280 trees were made in the autumn when their water content was at its minimum. The undried test samples were weighed in the forest immediately after they had been taken from the trees. Only sound trees belonging to the dominant class and more than 20 centimeters in diameter at breast height were used.

The samples were taken by the auger cylinder method (used by Hartig and others), which the author considers sufficiently reliable if due attention is paid to the comparability of the sample trees and the identity of their position, and if the results are not considered as absolute but relative.

After making comparisons of the weight of undried wood, air-dried wood, and absolutely dry wood, the author claims no definite conclusions on the basis of the mean values because of the insufficiency of the materials for mathematical treatment. He therefore subjects the rough curves drawn on the basis of his results to an examination and arrives at the following conclusions:

1. Undried wood, both sapwood and heartwood, is indisputably heavier in Myrtillus type than in Vaccinium type. This is indicated by both the mean values and the limits. In any case, undried sapwood in Myrtillus type is heavier than in Vaccinium type.

2. If air-dried heartwood is examined in its entirety, *i. e.*, not only the part grown in the same years or years near to each other, it is noticed that there is no distinct difference between the specific weights of the Vaccinium type and the Myrtillus type.

3. Air-dried sapwood is heaviest in the Myrtillus type.

4. Air-dried heartwood is heaviest in the Vaccinium type, but between the Calluna type, the Vaccinium and the Myrtillus types, there seem to exist no wide differences. In the Oxalis-Myrtillus type it seems to be lightest of all.

5. The sapwood of absolutely dry wood is heaviest on the Calluna type. This is indicated, among other things, also by the slower growth of the trees on this type than on others. Absolutely dry heartwood may be heaviest in Vaccinium type, but on the whole it may be admissible to presume that the weights of absolutely dry wood vary exceedingly little.

From what has been adduced above the author believes that, even the data on a few hundred trees from an area of a few hectares sufficiently authoritative to support the statement that the weight of wood depends on forest types. In the best forest types, for example the Oxalis-Myrtillus type, the wood is lighter than in the types which occupy the poorer or medium forest land. It has further been shown that undried and air-dried wood is heaviest in the Myrtillus and the Vaccinium types, the undried wood being in all probability heavier in the Myrtillus type than in the other forest land types.

The results of these investigations indicate that either the Vaccinium or

the Myrtillus type represents the optimum of specific weight. But they do not establish which type represents the greatest specific weight.

If the rôle played by the specific weight in the calculations of the quality quotient, for instance, is taken into account, it becomes obvious that the different forest types must have different quality quotients. Accordingly, the forest type will indisputably be of decisive significance for judging the quality of wood.

BENSON H. PAUL,
U. S. Forest Products Laboratory.

Experiments to Determine the Influence of the Time of Felling on the Properties of Wood of Norway Spruce and Silver Fir. Part II, Influence of Time of Felling upon Durability. By Ernst Gäumann. *Supplement to the Journal of the Swiss Forestry Society. No. 6. Part II. Büchler & Co. Bern. 1930.*

Felling time influences the durability of fir and spruce woods. This influence operates differently according to the technical uses of the wood.

In the experiments described with logs that were left with their bark on for one year, it was found that those felled during September and October were least affected by fungi, while those felled from March to June were most affected. The advantage of autumn felling is, however, nullified by the fact that bark beetles attack autumn-felled logs during the following spring. On the whole, it appears that a certain condition must be obtained to attract bark beetles.

Logs that were peeled and left for a year contained in all cases less decay than those left with bark intact, regardless of whether they were let lie on the ground or were stored above ground. Again, the least affected with fungi were those felled in September and October, while those felled from May to July were most affected.

The durability of beams that had been buried for two years depended upon the "ripeness" of the wood. Decay in beams of green sapwood was three to five times greater in those felled from May to July than it was in those felled from September to January, while beams of heartwood decayed only twice as fast when cut from May to July. Beams from trees felled during the summer and left to air-dry for a year, decayed only twice as much in the sapwood and less so in the heartwood, than did those felled during fall and winter.

In the experiments the spruce wood was more resistant to decay than was the fir wood. This may not, however, have much practical significance.

Laboratory experiments in which the woods were kept at optimum temperature and moisture condition for fungus growth and were then subjected to pure cultures of four different kinds of fungus, brought out the following results:

1. Woods vary in their resistance to fungus infestations according to variations in climate.

2. Fungus growth varies with the climatic changes of the year.

The variable resistance of the wood to fungus is closely related to the annual ring growth. With regards to fungus resistance alone, fir and spruce should not be felled from the time that annual growth commences up to the time when ring growth has been completed. At the time of greatest chemical changes—the growing season—the wood is most susceptible to decay. As the growing season varies with locality, species, and climate, definite limits of the favorable and unfavorable felling time with respect to fungus infestation, may not be definitely given. The facts here brought out indicate that November and December are the best months for felling and May and June the worst.

The reason for this variation in fungus resistance of fir and spruce wood is less due to the variable contents of cells, such as carbohydrates, nitrogen, phosphorus and salts, than it is to the variable "kolloidchemischen" behavior of the cell walls themselves, especially that of cellulose and "xylans." These variations varied in effectiveness with each of the four fungi tested.

By storing the wood in a dry shed, under which condition the nutrients could not escape, the degree of decay was reduced to one half. The difference in felling time was still evident, but was not of sufficient bearing to have any practical influence. The cause of this increased decay resistance appears to lie in the "kolloidchemischen" ripening process of the structural material, especially cellulose and "xylan."

By leaving the wood out in the open, exposed to the weather for a year, felling time ceased to have any influence on durability whatsoever. Again this appears to have been caused by rapid changes in the structural material, especially cellulose. The variable resistance of the wood to the different fungi was also absent. When wood materials are left to dry, the "kolloidchemische" ripening of the wood gives it greater resistance to decay. Hence, the effect of felling time on durability is only in evidence when wood is used in a green condition.

R. H. Klugh,
University of California.

The Chemical Eradication of Ribes. By H. R. Offord. *U. S. Dept. of Agr. Tech. Bull. No. 240, May, 1931: Pp. 1-24.*

The eradication of Ribes under varied field conditions in the "Inland Empire" by the methods of hand pulling and grubbing is very costly. Experimental control work in Idaho and Montana has shown a high cost per acre because (1) Ribes are generally very abundant, (2) certain species layer prolifically, and (3) the task of removing broken off roots and stems of such plants requires much time and labor.

In the effort to find a cheap, effective chemical for the destruction of these plants, twenty-five or more chemicals were tested on *Ribes petio-*

lare, R. lacustre, and *Ribes inerme.* Sample areas, representative of different sites were selected for the making of the tests. One area near Wallace, Idaho, was selected because it was representative of marshy land where *Ribes petiolare* and *R. lacustre* were abundant. Plots at Santa, Idaho, were located in a cut-over and burned-over tract. A third area was selected at Clarkia, Idaho, where all three species of Ribes occurred. This third area was representative of a typical "stream type" which is so common in the region.

Sodium chlorate 25 per cent aqueous solution applied at the rate of 1 quart per plant and an aqueous solution of sodium hydroxide 4 per cent plus sodium fluoride 5 per cent applied at the same rate were found to be the most satisfactory. It was found that one application of from 10 to 50 per cent aqueous solution of sodium chlorate to the above-ground portions or *R. petiolare* kills 96 to 100 per cent of the treated plants. *R. lacustre* and *R. inerme* exhibited some resistance to the sodium chlorate sprays. Many treated plants reëstablished themselves by sprouting from the base. Three applications of the 25 per cent solution, however, gave from 98 to 100 per cent kill of these Ribes.

The sodium chlorate spray is most effective when it is applied just after the Ribes have fully leafed out. Warm bright weather for a few days after the spray is applied, the presence of dew at night and comparatively high humidities are favorable to the toxic action of this chemical on the bushes.

Three-gallon hand sprayers of the compressed air type, and on large scale spraying operations, a knapsack tank sprayer with hand pump attached and a specially devised portable power sprayer were used.

The problem of eradicating Ribes has grown to such staggering proportions that the results of this work on chemical methods of attack will be a most welcome contribution to blister rust control work. It appears to be certain that chemical eradication is not only more practical but also more effective in the West than the methods used so extensively in the rust infected areas of the East.

Dow V. Baxter,
University of Michigan.

Science Forestière et Sylviculture. (Forest Science and Silviculture). By A. Joubert. *Rev. des Eaux et Forêts, Vol. 69, No. 3, March, 1931: Pp. 194-209.*

M. Joubert attempts to clarify the confusion which is current as a result of the interchangeable use of the terms silviculture and forest science by many foresters. He maintains that silviculture is, can be, and should remain only a technique of application of a superior forest science. Silviculture, like any technique, is subjective and a science can only be objective. The best silviculture is that which obtains the highest return, direct or indirect, for the agency for whose benefit it is employed. Silviculture may be good or bad. It has relativity. The principles of forest science can not

be good or bad or relative, but only absolute, like all true scientific principles.

Silviculture is defined as the culture of the forests, the definition of Lorenz and Parade. Forest science, over and above silviculture, M. Joubert finds it necessary to attempt to define for the first time. It is the science which will study the forest formations, their rôle, their constitution, their evolution, the reciprocal relations between them and the environment. He avoids the word forest because he feels that no one can say what a forest is. "Forest formation" is defined as a group of suberoligneous plants, living in a symbiotic relation (or in association). He thus intentionally excludes monocotyledonous communities, such as palms and bamboos. Furthermore, he eliminates from the field of forest science all considerations of intrinsic qualities, possible utilization or value of the products of the forest formations.

Forest science, like other natural sciences, should be based upon experimentation as yielding the surest and the only immediately conclusive results. But scientific experimentation must be absolute. It must be carried out under conditions (1) exactly known, and (2) in consequence, exactly comparable. M. Joubert considers that forest experimentation has not met these requirements and that, therefore, it is difficult to attribute to it true scientific value. He draws a sharp line between experimentation and comparative research. The latter has yielded and will continue to yield valuable results for the technician in silviculture but it is subjective and not scientific experimentation.

The evolution of forest formations, like the phenomena of astronomy and geology, is too slow for the periods of time available for human experimentation. There remains observation and the coördination of observations. Suitably established biological phenomena in the life of the forests will permit inductive reasoning leading to the necessary syntheses. Deduction of consequences will then provide the facts to verify or disprove the inductions.

Forest science, as distinct from silviculture, M. Joubert considers at the present time to be a subject of suspicion by scientists in the related fields of biology, geography, geology and sociology. The contacts are incomplete and unsatisfactory because of lack of serious purpose in specifically forest studies and because of lack of definite collaboration with foresters. Botanical geography and phytosociology seem to offer the closest approaches to the field of forest science. M. Joubert proposes to present in a subsequent article his ideas of the guiding principles which should serve to establish a true forest science.

The same lack of recognition of the difference between forest science and silviculture, between experimentation and comparative research, exists generally in the United States. We have our silviculture more or less adapted to economic considerations. We have our comparative research, the successive remeasurement or examination of adjacent areas subjected

to different treatments. But we also have at least the beginnings of experimentation. Laboratory tests of seed and seedlings of forest trees are being carried out under controlled and comparable conditions of temperature, moisture, and light. Even in the relation of forests and water from which M. Joubert draws his examples of the difficulties of experimentation, the pioneer efforts in the application of experimental methods have been surprisingly successful. Obviously, the complete evolution of forest formations can not be a subject of experimentation but many of the briefer processes, like those of forest regeneration in relation to environmental factors, can be so studied. Forest experimentation and a forest science are developing but they must be supplemented by the methods of comparative research and biometric analysis to yield the basis for the best silvicultural technique. And after all, forest science and silviculture, although they may be separated in name, must go hand in hand and both derive their importance from the contribution they make to forestry and to the economic and social betterment of mankind.

J. Kittredge, Jr.,
Lake States Forest Experiment Station.

Small Dimension Lumber Manufacture. By Harry B. Krausz. *Yale University School of Forestry Lumber Industry Series X. Pp. 19. 1931.*

The subject matter of this bulletin, the tenth in the Lumber Industry Series of the Yale University School of Forestry, was presented in an address at Yale on February 20, 1931. As mentioned in the introduction this Lumber Industry Series have been financed through a fund, the balance left in the 10th and 20th Engineers Relief Fund, presented to Yale University in 1920.

The author is manager of the Dimension Division of the Pearl River Lumber Company and speaks from years of actual experience in manufacturing hardwood dimension stock.

In the early stages of small dimension lumber manufacture, three general industries were catered to:

1. *Vehicle.* Absorbing approximately 60 per cent of production.
2. *Agricultural implement.* Absorbing approximately 25 per cent of production.
3. *Furniture.* Absorbing approximately 15 per cent of production.

The changes in demand are clearly brought out and have followed the trends from horse drawn vehicles through the various stages in the automotive industry.

The present day principal volume industries may be classed as follows:

1. *Automobile.* Absorbing approximately 50 per cent of production.
2. *Furniture and allied.* Absorbing approximately from 30 to 35 per cent of production.
3. *Agricultural implement.* Absorbing approximately 10 per cent of production.
4. *Vehicle.* Absorbing approximately from 5 to 10 per cent of production.

Each of the four consuming industries is discussed in some detail. The

species, sizes, and general qualities required for each use are fully described.

The author shows that the manufacture of small dimension offers an outlet for much material which under ordinary utilization methods is either left in the woods as tops and short lengths, or is wasted in slabs and short lengths at the mill.

"Increased utilization of standing timber, by reason of small dimension lumber manufacture, combined with standard saw milling operation, is made possible by the use of:

1. *Short logs*—after timber has been logged in the usual commercial logging practise.

2. *Bolts*—from clear stem lengths left in the tops after commercial logging.

3. *Small logs*—which cannot be profitably handled for lumber production through the sawmill.

4. *Low-grade logs*—the material from which can be converted into small dimension lumber products to better advantage than into lumber products.

5. *Miscellaneous species*—which because of their relative scarcity are expensive to handle as lumber, but which can be more readily moved with other species when manufactured into small dimension."

As the old, virgin timber becomes increasingly scarcer, and second growth stands are further relied on to produce our hardwood requirements, the small dimension mill is bound to play an increasingly important rôle. Our hardwoods are primarily remanufactured into articles using short lengths and odd sizes which can be produced more economically by a small dimension mill than by having to cut them from lumber.

G. H. Lentz,
Southern Forest Experiment Station.

The Gluing of Wood. By T. R. Truax. *U. S. Dept. Agric. Bull. 1500. Pp. 78, 18 figs., 9 tables, and 13 plates. 1929.*

This well illustrated bulletin is the result of several years of observation in the wood-using industries and research at the Forest Products Laboratory. The direct style in which it is written makes it easy to read and understand. The kinds of glues, the technique of gluing, the preparation of the wood, the drying and conditioning of joints, the gluing characteristics of the commercially important woods, and the principles of glued wood construction are all discussed briefly.

The different classes of glues, such as animal, vegetable starch, casein, vegetable protein, liquid and blood albumin, are considered first. "There is no one glue, or class of glues, that is superior in all respects to all others. Each class, because of its superiority in one or more particulars, may be expected to find preference for certain purposes. In some cases two or more glues may be found to meet requirements equally well." A satisfactory glue must be durable and

sufficiently strong to produce a joint whose working life will compare with that of the wood itself. Glues, besides being low in price, should have a large spreading capacity, be easy to mix and apply, and be free of bubbles or foam. Certain classes of glue have properties which make them more suitable than others for particular uses. In very thin veneers which may stain through, a stainless glue must be used. For exterior uses, such as aircraft parts and exterior doors, a glue must be water resistant. In general, glues used in large industries, where production must be rapid and the cost low, should set quickly and not dull the cutting edges of machinery used in further manufacture.

The methods of testing glues, preparing them for use, and preparing the wood for the gluing operation, are discussed briefly. The wood should be free of machine marks. Roughening of the wood to make more surface for the adhesive, which is sometimes recommended, is said to be of doubtful value. Comparative strength tests of smooth and roughened surfaces have failed to show any advantage of the latter treatment. The preparation of veneer for gluing, and the use of paper and cloth tape in the operation is critically discussed, emphasis being placed on the quality of the final product.

The discussion of the control of the gluing operation, and the drying and seasoning of the glued joints covers such points as drying plywood and panels, the relation of pressure and glue consistency to assembly time. The part on gluing characteristics of various kinds of wood is especially well written and well illustrated with figures and tables showing the results in detail. Forty common species of wood and three classes of glues (casein, animal and vegetable) were used in the tests. The density of the wood is very closely related to the gluing properties of each species. The three classes of glues used showed slight differences in strength tests—the animal glue being somewhat stronger. Among the very hard woods, such as osage orange and hickory, there was almost no failure of the wood. The softwoods, however, such as redwood and western red cedar showed glued joints stronger than the surrounding wood. The effect of treating the very dense woods before gluing with a ten per cent solution of caustic soda, increased the strength of the joint. After such treatment, osage orange, glued with casein glue, gave very satisfactory results.

Various glue formulas and tests are included in the appendix and further information concerning gluing principles and operation can be found in the literature cited. Although the data presented could have been expanded into a large volume, it has been condensed and so clearly written, illustrated and supplied with footnotes that there is no doubt of its value to the wood-using industries.

Warren W. Chase,
University of Minnesota.

Pulpwood As A Cash Crop. By R. W. Graeber. *North Carolina Agri. Exper. Sta. Bull. No. 180. 1930.*

The aim of this publication is to interest woodland owners in taking out pulpwood. Emphasis is given to the money returns of such an operation. "Pulpwood has become a cash crop that pays the labor costs of harvesting and marketing and gives a fair return for the timber stumpage." Figures are presented on the cost of the different operations involved in getting out pulpwood and two examples are cited showing the returns from operations handled on a "thinning and management basis."

The principal headings in the circular are: Harvesting Pulpwood Fits a Farm Program, Marketing Requirements, Cost of Cutting and Marketing, Methods of Harvest, How Pulpwood is Sold.

Under the heading Methods of Harvest, clear cutting, selective cutting and thinning are listed as the three methods for taking out pulpwood. Clear cutting is dealt with very briefly and is not recommended. The selective cutting method could have been made clearer with a fuller explanation of the procedure and application of the practice. Thinning is discussed rather fully with emphasis placed on the taking out of the more inferior trees and leaving the better trees for a future crop. "When this system is followed the farmer can, with the next crop, meet the demand for lumber, poles, piles, pulpwood, etc." The text does not present a plan for growing pulpwood as the only crop but considers pulpwood as an intermediate crop in growing such other products as lumber, poles, etc.

Under the heading, "How Pulpwood is Sold," it is brought out that contracts calling for 100 cords or more are made with the individual farmer or timber operator. The cord is mentioned as the unit of measurement but without an explanation of the kind of a cord used. A statement in one of the legends indicates that a long cord of 160 cubic feet is referred to. However, for the sake of clearness a full statement of the cord measurement might have been included in the main text.

At the close of the circular the reader's attention is directed to the county agent and the extension forester as the sources for further information on markets.

The circular is written in popular style using language easily understood by farmers. It is well illustrated with 7 photographs and as a whole appears very attractive. The publication has an appeal which should cause the owner of woodlands to make further inquiry. The publication should prove to be a very useful addition to North Carolina's popular forestry literature.

W. K. Williams,
Extension Forester,
U. S. Department of Agriculture.

Marketing Illinois Forest Products. By L. E. Sawyer. *Illinois Agric. Exp. Sta. Circular 361. Pp. 15, Illus. 1930.*

This circular was prepared in response to numerous requests from farmers for information on the marketing of woodland products. Mr. Sawyer discusses briefly the methods commonly used in selling timber in Illinois as (1) by lump or lot, (2) by log scale, (3) by price or count, and (4) by lumber tally.

A table is included giving contents of logs of diameters from 6 to 36 inches and of lengths from 8 to 16 feet as scaled by both the International and Doyle rules. No other measuring information is given in the publication.

Four pages deal with the market specifications of such products as logs, cross ties, piling, pulpwood, handle stock, cordwood, etc. Some figures are given showing the range in price of logs and lumber for a few of the commercial species. A suggestive timber sale contract is also included to guide the seller in drawing up an agreement when selling timber on the stump.

The circular very briefly discusses the merits of selling direct, coöperatively and in car-load shipments and also includes general recommendations for selling which should be of value to farm woodland owners. The circular is sent out accompanied by a rather complete list of buyers. This mimeographed list contains more than 125 names of individuals and firms that buy forest products in Illinois. Apparently considerable effort was made to secure this list of buyers and also to get the information on the kind of products bought.

The circular accompanied by this list of buyers should be of practical assistance to farmers. It brings together marketing information in simple and understandable language. Such material is very timely during the present period of agricultural depression when farm owners are falling back on their woods to bridge the gap of a lean financial year. The publication should meet an urgent need in extension forestry work in answering the numerous requests for marketing information. It is praiseworthy in attacking one of the most troublesome problems in farm forestry work. The circular is printed on good quality paper with an attractive arrangement of illustrations and discussions which should cause the farmer to read it through.

W. K. Williams,
Extension Forester,
U. S. Department of Agriculture.

Recreation Resources of Federal Lands. Report of the Joint Committee on Recreational Survey of Federal Lands of the American Forestry Association and the National Parks Association to the National Conference on Outdoor Recreation. *National Conference on Outdoor Recreation, Washington, D. C. Pp. 141. 1928.*

These are belated comments on a report, published in 1928, of a joint committee on Recreational Survey of Federal Lands of the American Fores-

try Association to the National Conference on Outdoor Recreation.

The significance of the study and report is emphasized by the personnel of the committee which conducted the study and by the make-up of the President's committee on Outdoor Recreation, which latter consisted of the secretaries of the War, Interior, Agriculture, Commerce and Labor departments.

The report deals with three broad subjects: I. The Public Domain, II. The National Reservations, and III. Elements of a Federal Recreation Policy. The survey was made "during a period of contending uses in a field still subject to great change." It refers to the early federal land policy as one of disposal, patterned after that of the original thirteen colonies and of England, France and Spain, and brings out the belated activity of the nation in the reservation and administration of public lands for aesthetic enjoyment, historic or scientific appreciation and economic uses. Outdoor recreation did not become widespread until following the World War, when the country was put on a motorized basis. The birth of the recreation idea in its large sense was not until about 1918.

The report tabulates 418 reservations among the different federal departments, aggregating 144,743,395 acres of lands embracing recreation resources. More than 90 per cent of these lands are within the national forests. Twenty territorial reservations involving 26,014,400 acres are also listed as having recreational possibilities; and 269 areas involving 229,360,585 acres. Of this last nearly 194,000,000, or about 85 per cent, is vacant public lands.

Lands east of the 100th meridian containing only a fraction of one per cent of the vacant public lands, are treated separately from those west of this Meridian. Their principal value would be for wild life and not park purposes, the report states.

The largest areas of vacant lands west of the 100th meridian having the greatest recreational promise are the "Badlands" region of western North and South Dakota and eastern Montana, the Owyhee country of southwest Idaho, southeast Oregon and northern Nevada, and the Plateau country of southern Utah and portions of adjoining states. Each of these regions are briefly and interestingly described. The recreational values of the public domain are said to be indeterminate but as the west develops attention should be given to the reservation of tracts which will serve their highest use for state or local recreation needs. The Secretary of the Interior under the Recreation Act of June 14, 1926, has authority to so classify lands and has exercised this power from time to time.

The report treats fully the existing National Parks and National Monuments, and other federal reservations, and brings out that the American people turn naturally to the mountains and the woods for their outdoor recreation. Wilderness areas are also emphasized as of growing importance, and provision should be made for more of that form of recreation. Twenty-one of such areas are listed, described, and indicated on a map in ten western states and Minnesota. These areas lie mostly within the National Forests. The orderly development of national forest and other public lands will require that recreation

be considered in planning the utilization of resources.

There is a chapter on the relation of national forests and national parks, which brings out that the most important recreation assets under federal administration are within these two classes of area. The fundamental differences of the two are also brought out. Prominence is given to wild life as a large factor in recreational considerations, and the importance of national and state game refuges stressed.

The bulletin closes with a chapter on the "Elements of a Federal Recreation Policy." Twenty-two recommendations are made, concerned principally with laws, legal definitions, appropriations, standard classifications, research, a longtime program, and other matters pertinent to the subject.

JOHN H. HATTON,
U. S. Forest Service,
Denver, Colo.

Public and Semi-Public Lands of Connecticut. By Philip L. Buttrick, *Formerly Secretary, Connecticut Forest and Park Association. State Geological and Natural History Survey Bul. 49. Pa. 151. Hartford, 1930. $1.00.*

This bulletin contains the results of a comprehensive study of the character of Connecticut's public lands. The author, forestry-trained at Yale University, discusses the public ownership of land in America in its general aspects, the reasons for such ownership, methods of acquiring and financing public lands, their taxation and disposal, and their uses. Lands used for parks, parkways, forests, and as wild life preserves are given particular attention, and the author frequently dwells boldly on state policies that should guide their handling and extension. The bulletin is well illustrated with maps and charts indicating ownership, uses, and population trends, and the text is strengthened with many tables. A large-scale map in an envelope shows the distribution of public forests, parks, game sanctuaries, and such semi-public lands as water company lands. This map and the smaller scale population, forest area, and drainage maps serve as excellent basis for planning future acquisitions; in fact, the entire study is a stock-taking of land resources with a view to predicting future population concentrations, their needs for publicly owned forests, parks, and watershed protection areas, and where these can be located. Inasmuch as Connecticut approaches European conditions more nearly than any other American state as to urbanization, the need for the survey seems obvious. Six per cent, or 190,000 acres, of the state's area is publicly or semi-publicly owned, but the author feels that the growing population requires that at least 500,000 acres should be set aside for public purposes and that it should be acquired, gradually and consistently, according to a definite plan.

The work of the author shows a thorough understanding of the problem given him, and painstaking detail in working it out. His bulletin should serve as an excellent guide for other states in making similar surveys.

EMANUEL FRITZ,
University of California.

CORRESPONDENCE

Editor, JOURNAL OF FORESTRY,

I wish to call to your attention a couple of statements in the October number of the JOURNAL OF FORESTRY which are contrary to fact and which you may wish to call to the attention of your readers. I realize that I may be out of order in writing to you thus, as I am not a member of the Society of American Foresters, but merely a regular reader of the JOURNAL.

First, on page 926 is mentioned a recent publication of the Florida Forest Service in collaboration with the United States Forest Service. It is unfortunate that the United States Forest Service name is used to give weight to the statements from this publication as the U. S. Forest Service did not approve of the publication of "Florida's Forest Land Problem."

Second, on page 927 the reader would certainly imply that the California laws grant absolute tax exemption to forest lands. Again on page 928 is the statement, "The Florida owner of cut-over land is not asking total exemption as in California . . . ." It is our understanding that the California laws provide for the exemption of immature trees only; cut-over land, and land and mature timber is taxed in the same manner as other property.

Your excellent editorial in the October JOURNAL contains many important and interesting suggestions. I have a comment to make regarding the short paragraph on page 874. I know of no evidence to prove that taxes have been a determining factor in the decision of any timber enterprise to liquidate its investment in timber, except in border-line cases. My experience with the Land Economic Survey in Michigan leads me to the following conclusions:

Timber was not necessarily "taxed beyond its means" as the timber was not owned by producers but rather speculators and then timber miners. Lower taxation, lower than that on property in the next county, postponed cutting for only a very few years.

County people realized that the timber was going and going fast in their county, so it was a case of "quick realization" from the timber or no realization at all for funds to build permanent and substantial public improvements. If taxes for such improvements were not derived from a levy on the timber before it was cut, a larger share of their costs would have to be paid by the farmers who were to follow the lumbermen in ownership of the land.

It was most profitable for the owners, not growers, to cut their timber in the Lake States as soon as their scale of operations would permit, even if no taxes at all were levied. Crawford County, Michigan, built substantial county buildings in the 80's out of a tax levy which fell principally on timber, while Roscommon County, adjoining, did not, but both counties are now equally barren of timber.

WADE DEVRIES,
Taxation Economist, New Haven, Conn.

SOCIETY AFFAIRS

Doings of the Executive Secretary

Since the present incumbent took office last April, he has been so busy getting ahold of the job, and *doing* things, that he has only just now found time to sit down and *write* about them. This would be a mistake with any other organization than the Society of American Foresters, because the average run of people are prone to judge a man—how good he is and whether or not he is earning his pay—simply by what he says about himself.

Until well into July, it was necessary for your Executive Secretary to devote from one-half to two-thirds of his time in assisting the Executive Secretary of the Timber Conservation Board in getting that body lined out right and its program operating smoothly. During July, he spent a material amount of time in New York and New England with several members of the Society, discussing with them the Sustained Yield Project of the Timber Conservation Board and its possibilities, and, incidentally, getting their slant on Society Affairs and policies. On July 30th, 31st, and August 1st he attended the summer meeting of the Allegheny Section at Elkins, West Virginia. One of the principal topics of conservation, on the side lines, was that Section's proposal to change the Society's system of elections from a proportional representation system to a sectional representation. Since two other Sections; namely, the Gulf States and the Ozark, have endorsed the Allegheny Section's proposal with modifications, this question, no doubt, will have to come up for consideration at the next meeting of the Council.

On August 26th and 27th, the Executive Secretary attended the annual meeting of the Society for the Protection of New Hampshire Forests at New London, New Hampshire, and participated in a discussion of ways and means for continuing the Federal Forest Acquisition policy.

On September 3rd and 4th, he attended the joint meeting of the New York and New England Sections of the Society at Poughkeepsie, New York, and before returning home, spent a few days in the Adirondacks, including a conference with George N. Ostrander, of the Finch Pruyn Company, and Professor A. B. Recknagel, of Cornell, concerning the Timber Conservation Board's Sustained Yield Project as related to the Northeast, and also a visit to the Cornell Forest School summer camp near Newcomb, New York. At the Poughkeepsie meeting, opportunity was had to meet with three members of the Society's Council in regard to Society Affairs; namely, Tillotson, Hosmer, and Howard.

In continuation of the policy to par-

ticipate in section meetings, the annual meeting of the Ohio Valley Section, at Louisville, Kentucky, was attended on October 30th and 31st. Ways and means of increasing the membership were discussed with the officers of that section.

During the two weeks, November 9 to 21, the Executive Secretary's time has been pretty well taken up with Timber Conservation Board matters. On November 10th there was a hearing before the Board on the Naval Stores Industry. It was attended by representatives of the Naval Stores Industry, dealers, factors and producers. November 16th was a full meeting of the Advisory Committee of the Timber Conservation Board to check up on the progress of the work up to date. A meeting of the whole Committee was followed by meetings of the several subcommittees in charge of the various projects of the Board.

The time intervening between these several meetings has been devoted to routine matters in the Society office—assistance to the Editor and Business Manager in getting out the JOURNAL; assistance to the Nominations Committee in preparing its slate for the coming election of new members to the Council; and assistance to the Committee in charge of the preparations for the coming Annual Meeting at New Orleans.

FRANKLIN W. REED,
Executive Secretary.

MORE ABOUT THE ANNUAL MEETING

Requests for hotel reservations indicate that the New Orleans meeting will have members of the Society in attendance from all parts of the United States. You cannot afford to miss this meeting.

The field trip covering the largest single pine operation in the South will show what can be done with longleaf and slash pine with proper protection from hogs and *Fire*. New Orleans will be the rendezvous for foresters. Here you will meet old friends and make the acquaintance of others you now know by name only. If you are married, bring your wife and let her enjoy the interesting sights of New Orleans; the Vieux Carre is full of old world charm and sight-seeing trips will be arranged for the ladies.

Everyone interested in forestry, in the lumber industry or other industries, should hear the paper to be presented by Ripley Bowman, Executive Secretary of the Timber Conservation Board. Mr. Bowman will bring word concerning the recent meetings and finding of the Board, and a lively discussion on this paper is anticipated.

Due to P. D. Kelleter's illness, he will be unable to be present, but F. G. Wilson, Chief Fire Warden for Wisconsin, is pinch hitting for him. Wilson will tell about the workings of the Wisconsin County Forest Law and how it is working out.

The free boat trip Wednesday noon aboard the New Orleans Dock Board's Yacht will enable you to see a broad expanse of Father Mississippi and the harbor developments along the shore.

Two "nigger flatheads" from the Louisiana bottomlands have been hired to enliven the banquet and give some high lights on the forest research

work being carried on in the South. You won't be asked to eat corn pone, grits or pot likker at the banquet, but you can have them if you like. The hotels will make every effort to fill your wants, and are prepared to serve you with the dishes which have made the Creole cuisine famous.

If you have not already informed Gus Lentz that you are coming, please do so *tout de suite* at Southern Experiment Station, 348 Baronne Street, New Orleans, La. You can't afford not to be in New Orleans for the meeting. *Remember, the dates are December 29, 30 and 31.*

COMMITTEE ON MEETINGS,
G. H. LENTZ, *Chairman.*

TRANSPORTATION TO AND FROM ANNUAL MEETING AT NEW ORLEANS

The American Association for the Advancement of Science has issued a bulletin regarding transportation for those planning to attend the New Orleans meeting in December.

"There will be a choice of two kinds of reduced railway fares: (1) on the standard certificate form and (2) short limit round trip winter excursion fares.

(1) Reduced railway rates, by the standard certificate plan, have been granted by all of the railway passenger associations in the United States and by the eastern lines of the Canadian Passenger Association, but a few companies, listed below, have not granted reduced rates. The round-trip fare by this plan is one and one-half times the regular one-way fare.

Tickets to New Orleans by the standard certificate plan are to be purchased within time limits as follows: December 21 to 27, inclusive, for Canadian Eastern lines, Central lines, and Trunk lines. For New England lines, December 20 to 26, inclusive. For Southeastern lines, December 22 to 28, inclusive. For Western and Transcontinental lines the inclusive dates are December 18 to 24 from California; December 19 to 25, from Arizona, British Columbia, Idaho, Montana, Nevada, Utah, Washington, and Oregon (except *via* California); December 17 to 24 from Oregon (*via* California); December 20 to 26 from New Mexico, Wyoming, and Colorado (except Julesburg); December 21 to 27 from Julesburg, Colorado, and from Illinois, Iowa, Kansas, Manitoba, Minnesota, Missouri, Nebraska, northern Michigan, North Dakota, South Dakota, and Wisconsin. For the Southwestern lines the inclusive dates are December 20 to 26 from Oklahoma and Texas and December 21 to 27 from Arkansas, Kansas, Louisiana, and Missouri; also Memphis, Tenn., and Natchez, Miss.

The following Southwestern lines do not offer reduced fares on the certificate plan: Arkansas and Louisiana Missouri Railway, Fort Smith and Western Railroad, Graysonia, Nashville and Ashdown Railroad, Missouri and North Arkansas Railway, Oklahoma City-Ada-Atoka Railway, Wichita Falls and Southern Railway, Kansas, Oklahoma and Gulf Railway, National Rail-

ways of Mexico, and the Midland Valley Railway.

Persons residing in the regions of reduced rates (almost all the United States and Canada) should each purchase a first-class, full-fare, one-way, through ticket to New Orleans, being sure to secure a certificate on "Standard Certificate Form," reading for the New Orleans meeting of the American Association for the Advancement of Science and Associated Societies." A receipt is not required and will not be useful.

Persons residing outside the regions of reduced rates should each purchase a round-trip ticket to the nearest station issuing through tickets to New Orleans and situated within the region of reduced rates. On arrival at that station a one-way ticket to New Orleans and a certificate, as directed in the preceding paragraph, should be secured.

Every one should register immediately upon arrival at New Orleans, at the registration offices of the American Association for the Advancement of Science for the meeting, in the Roosevelt Hotel. Be sure to fill in all blanks on the registration card and leave the card at the registration desk, where you will receive a numbered identification card, which will be receipted for the registration fee paid. Then leave your railway certificate at the validation desk, being sure that the identification card (which you keep) is there marked to show that you have deposited a certificate. Your certificate will subsequently be endorsed by the Association and then validated by the agent of the transportation companies. Call for it later at the validation desk, where you left it, presenting your identification card.

Unvalidated certificates will not be honored for the purchase of return tickets and unendorsed certificates can not be validated. Registration is therefore necessary in order to have a railway certificate validated. Each person registering is entitled to the validation of his own certificate.

For the return trip, railway agents at New Orleans will honor any properly endorsed and validated certificate if presented at least thirty minutes before the scheduled time of departure of the train for which it is to be used. Each person presenting an endorsed and validated certificate may purchase a continuous-passage, one-way, return ticket for one-half of the regular fare, by the same route as that followed on the trip to New Orleans. Certificates may be validated from December 28, 1931, to January 1, 1932. The last date on which return tickets may be purchased is January 5.

(2) Short limit round trip winter excursion rates are available from many points in the United States to destinations in Alabama, Florida, Louisiana, and Mississippi, and also to Havana, Cuba. These rates have been granted for only certain days in November and December, 1931, and March and April, 1932. During December, 1931, round-trip excursion tickets to New Orleans may be purchased on the following days: 4, 5, 6, 11, 12, 13, 18, 19, 20, 25, 26, and 27. Tickets are limited to 16 days, including date of purchase and actual time required to return to starting point.

The following is a comparison of the cost under the two plans of a round-trip ticket (not including Pullman berth) from Washington, D. C., to New Orleans:

Standard Certificate form (One and one-half fares)	$60.30
Short limit round-trip winter tourist rate	54.30

It is advisable to get information from your local ticket agent about the excursion fares. . . .

Although the railroads require only one-hundred certificates to secure the reduced rates on the standard certificate form, it is quite probable that this number of certificates may not be received for validation in the registration office due to the short limit excursion fares. It is suggested, therefore, that where there is very little difference in the two forms of reduced fares that the standard certificate be used. This will assure reduced fares for those who must use the certificate form."

New York and New England Sections Meet Jointly

The New York Section was host to the New England Section at the summer meeting held at Poughkeepsie, N. Y. on September 3 and 4—about 90 members and guests being present. The inspection of sample plots in sprout hardwood stands on the estate of the late Colonel Archibald Rogers at Hyde Park took up the greater part of the first day. These plots were established by the U. S. Forest Service in 1905 and were remeasured by Mr. J. Nelson Spaeth of the Cornell Forestry Department in 1925 and 1930. Mr. Spaeth acted as guide and led the discussion at the various plots. During the latter part of the afternoon the estate of Governor Franklin D. Roosevelt was visited. Governor Roosevelt gave the combined Sections a very hearty greeting and impressed upon the members the importance of forest practice in relatively small areas and the successful marketing of the crop of timber. After the Governor's speech a short inspection trip was made to his older plantations and those recently established by the New York State College of Forestry. After a supper at the Nelson House, Poughkeepsie, an enjoyable informal program was presented. Professor Ralph S. Hosmer, Cornell, spoke about the early days in the Forest Service; Professor Ralph C. Hawley, Yale, told about work at the Eli Whitney Forest; and Mr. Franklin Reed, executive secretary of the Society, made a few remarks regarding Society affairs. Mr. C. R. Tillotson, on behalf of the New England Section, thanked the New York Section for their hospitality. Friday morning, September 4, was spent examining sample plots in plantations at the Diedrich Estate, Millbrook. These plots were established in white pine, Scotch pine, Austrian pine, Norway spruce, and European larch by the New York Conservation Commission. Mr. Stuart S. Hunt acted as guide and led the discussion at the different plots. The meeting adjourned at noon.

Harvey J. MacAloney,
Sec'y New England Section.

PERSONALS

V. A. Beede has been appointed instructor of forest management at Pennsylvania State Forest School. He was formerly with the Brown Company at Quebec.

Professor S. N. Spring has resigned from the department of forestry, Cornell University, effective February 1, to become Assistant Dean at New York State College of Forestry at Syracuse.

Professor T. J. Starker of the Oregon State College Forest School, Corvallis, Oregon, is visiting professor in silviculture at the Pennsylvania State Forest School, State College, Pennsylvania, for the present college year. Professor Starker is on sabbatical leave and is substituting for Professor H. J. Lutz, who is on leave of absence, taking his doctorate at the Yale Forest School.

Burt P. Kirkland, who left the faculty of the University of Washington this year to join the forest survey staff of the United States Forest Service, is now stationed at Washington, D. C.

Thornton T. Munger, director of the Pacific Northwest Forest Experiment Station, has been designated as official representative of the United States Forest Service at the Fifth Pacific Science Congress, to be held in Victoria and Vancouver, British Columbia, May 23-June 4, 1932.

C. C. Delavan, professor of forest extension, and Henry R. Francis, professor of forest recreation, of the New York State College of Forestry, have been granted sabbatic leave for the school year 1931-32. Professor Delavan will take up graduate work at the University of Michigan, and Professor Francis will work for an advanced degree at the University of Washington.

ERRATA

In the October 1931 issue of the JOURNAL OF FORESTRY the following corrections should be made:

On page 882, in the legend to Figure 1, the solid line represents killed seedlings while the broken line represents injured seedlings.

On page 978, the title of the book reviewed should read "Wood: Lumber and Timbers".

Elections to Membership

The following men have been elected to the grade of membership indicated.

ALLEGHENY SECTION

Junior Membership

Andrews, James P.
Cary, Egbert S.
Eye, Berlin

APPALACHIAN SECTION

Junior Membership

Pawek, Hugo J.

CALIFORNIA SECTION

Junior Membership

Barnum, Oscar L.
Bays, Isaac R.
Jensen, Herbert A.
Kohner, Wm. G.
Samon, Judell M.
Tyrell, Travis M.

Senior Membership

Beeson, Russell W.
Ellis, Guerdon
Price, Wm. S.

CENTRAL ROCKY MOUNTAIN SECTION

Junior Membership

Beals, James B.
Gilbert, Karl
Graw, Jack

GULF STATES SECTION

Junior Membership

Bickford, C. A.

MINNESOTA SECTION

Junior Membership

Anderson, Robert T.
Blatter, Paul W.
Robinson, Winfield N.

NEW ENGLAND SECTION

Junior Membership

Hancock, Chas. E.
Mardasheff, Ivan G.
Osterhout, W. Lyle
Woodward, Howard True
Vinton, Everett L.

Senior Membership

Gibbs, J. A.
Stafford, Earle
Thomson, Roy B.

NEW YORK SECTION

Junior Membership

Friedman, Philip F.
Rissman, Albert J.

Senior Membership

Foster, Clifford H.
Keib, John E.

NORTH PACIFIC SECTION

Junior Membership

Bassett, W. W.
Liersch, John Edward
McCannel, Kenneth C.
Moran, Wendell
Rapraeger, Elmer F.

Senior Membership

McArdle, R. E.

NORTHERN ROCKY MOUNTAIN SECTION

Junior Membership

Hibbings, H. W.
Jackson, Chester W.
McConnell, Earl
McLean, L. H.
Park, Berry C.
Ramsay, Marshall G.
Robb, Walter L.
Schroeder, August A.
Scribner, C. H.

OHIO VALLEY SECTION

Junior Membership

Marsh, A. Fletcher

OZARK SECTION

Junior Membership

Clemmensen, Niels K.
Dunn, Paul M.

SOUTHEASTERN SECTION

Junior Membership

Carter, Harold A.
Olsen, Carl F.
Snyder, Howard A.

WASHINGTON SECTION

Junior Membership

Bell, Claude C.
Bell, Wm. B.
Guild, Eugene R.
Hayward, Phillips A.
Sargeant, Howard J.
Van Huizen, Peter J.
Woodward, Doren E.

Senior Membership

Doppel, A. A.

Foreign

Senior Membership

(Reinstated)

Barbour, Wm. R.

Announcement of Candidates for Membership

The following names of candidates for membership are referred to Junior Members, Senior Members, and Fellows for comment or protest. The list includes all nominations received since the publication of the list in the October Journal, without question as to eligibility; the names have not been passed upon by the Council. Important information regarding the qualifications of any candidate, which will enable the Council to take final action with a knowledge of essential facts, should be submitted to the undersigned before January 15, 1932. Statements on different men should be submitted on different sheets. Communications relating to candidates are considered by the Council as strictly confidential.

FOR ELECTION TO GRADE OF JUNIOR MEMBER

Name and Education	*Title and Address*	*Proposed by*
Adams, Wm. P. La. State U., B.S.F., '31.	In business for self. P. O. Box 339, Baton Rouge, La.	Gulf States Sec.
Addison, William Florien La. State U., Summer School, '22, '23 and '24.	Resident Forester, Union Saw Mill Co., Huttig, Ark.	Ozark Sec.
Arnst, Albert Oregon State, B.S.F., '31.	Junior Forester, Regional Office, R-6, Portland, Ore.	North Pacific Sec.
Cox, Guy 8th grade.	Principal Forest Ranger, Big Flat, Ark.	Ozark Sec.
Fullington, Lloyd H. U. of Washington, B.S.F., '31.	Senior Forest Ranger, Mt. Baker N. F., Seattle, Wash.	North Pacific Sec.
Hiatt, Harlan C. 3 years in School of Forestry, Oregon State.	Junior Forester, Mt. Hood N. F., Welches, Ore.	North Pacific Sec.
Howell, Harold A. U. of New Hampshire, B.S., '30; Yale School of Forestry, M.F., '31.	Acquisition, The Unaha N. F., Bristol, Tenn.	Appalachian Sec.
Lane, George Ritchie Ontario Agric. College, B.S.A.; U. of Toronto, B.Sc.F.	Chief of the Protective Service, Canadian Railway, Lucerne-in-Quebec, P. Q., Canada.	New England Sec.
Manifold, Courtland B. Penna. State, B.S. in Agronomy, '19; Yale School of Forestry, Junior year, '28-29.	In charge of Soils Work, Plant Research Dept., Goodyear Rubber Plantations Co., Dolok Merangir, E. C. Sumatra, D. E. I.	J. S. Barnes, J. W. Toumey, H. H. Chapman, R. C. Hawley.
Monahan, Robert Scott Dartmouth, A.B., '29; Yale, M.F., '31.	Sawtooth N. F., Obsidian, Idaho (Temporary). School of Forestry, New Haven, Conn.	New England Sec.
Plusnin, Basil A. Imperial Institute of Forestry, Russia, M.F., '15; Yale School of Forestry, M.F., '31.	Forest Survey, Hartford Water Co., Barkhamstead, Conn.	New England Sec.
Raphael, Seymour N. Y. State College of Forestry, B.S., '31.	Student, N. Y. State College of Forestry, 251 91 St., Brooklyn, N. Y.	New York Sec.
Rector, Chas. M. U. of Montana, B.S.F., '31.	Junior Range Examiner, Ochoco N. F., c/o Forest Service, Prineville, Ore.	North Pacific Sec.

Name and Education	*Title and Address*	*Proposed by*
Peck, Ralph Howard Conn. Agric., B.S., '29; Yale, M.F., '31.	District Forester, Tennessee State Forest Service, Jackson, Tenn.	Appalachian Sec.
Roberts, Paul H. U. of Nebr., B.S.F.	Administrative Officer, Branch of Research, U. S. Forest Service, Washington, D. C.	Southwestern Sec.
Stocking, Edson None given.	Forest Superintendent, James Lippincott Goodwin, Hampton, Conn.	New England Sec.
Wilkinson, John Christopher Oregon State, B.S.F., '27.	Junior Forester, Olympic N. F., Snider R. S., Star Route 1, Port Angeles, Wash.	North Pacific Sec.
Strothman, Sylvester W. U. of Wisc., College of Agric., '05-06; U. of Mich., School of Forestry and Conservation, '06-09, A.B.; '09-10, M.S.	Teacher of Botany and General Science, Boys Technical High School, Milwaukee, Wis.	Wisconsin Sec.
FOR ELECTION TO GRADE OF SENIOR MEMBER		
Maughan, William U. of Minn., B.S., '25; Yale, M.F., '29. (Junior Member, 1927.)	Assistant Director, Duke Forest, Ass't. Professor of Forestry, Duke University, Durham, N. C.	Appalachian Sec.
FOR ELECTION TO GRADE OF HONORARY MEMBER		
Schenck, Dr. C. A. Giessen University, (Germany) Ph.D., 1895.	Darmstadt. Germany.	Gulf States Sec.

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Member of Council in Charge of Admissions.

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18th Annual Meeting
American Game Conference
December 1-2, 1931
New York City

Washington Natural Resources Association
December 3, 1931
Davenport Hotel
Spokane, Wash.

U. S. Chamber of Commerce
Western Division
December 4-5, 1931
Davenport Hotel
Spokane, Wash.

2nd Annual Meeting
Central States Forestry Congress
December 3-5, 1931
Cincinnati, Ohio

31st Annual Meeting
Society of American Foresters
December 29-31, 1931
New Orleans, La.

Drainage, Conservation & Flood Control Congress
February 17-19, 1932
Louisville, Ky.

5th Pacific Science Congress
May 23-June 4, 1932
Victoria and Vancouver, Canada

SECTION MEETINGS

Society of American Foresters

California Section
Fourth Annual Meeting
December 18, 1931
San Francisco, Calif.

New York Section
Annual Winter Meeting
Friday, January 29, 1932
Hearing Room, 1st Floor
State Office Bldg.
Albany, N. Y.

Section secretaries are welcome to use this box for announcing their meetings. Copy should be in the hands of the Editor or Executive Secretary one month before date of publication.

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